C005066

Client Version of the

Interface Configuration Document For:

CR900FD
CR1000
CR1400
CR2300
CR2600
CR3600
CR3600DPM
CR4405
CR6000
CR8000

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1 Scope

This Interface Configuration Document (ICD) specifies the communication protocol between the Code Reader™ 900FD (CR900FD), Code Reader™ 1000 (CR1000), Code Reader™ 1400 (CR1400), Code Reader™ 2300 (CR2300), Code Reader™ 2600 (CR2600), Code Reader™ 3600 (CR3600), Code Reader™ 3600 DPM (CR3600 DPM), Code Reader™ 4405 (CR4405), Code Reader™ 6000 (CR6000) or Code Reader™ 8000 (CR8000) hardware and application software that runs on the Host computer, specific Reader commands, examples of a variety of ways to communicate and send data to the Reader (i.e., RS232, USB) and command/communication types.

Make sure to use the latest released firmware for default values listed in Section 8.

2 Notations

The interface protocol is described as a set of grammars, indicated by different type styles and symbols. These indications are listed in the table below.

Example	Indication	Grammar
Text-Command	Italic type	Syntactic categories (non-terminals)
space	Bold type	Terminal symbols
0xFF	0x prefix indicating hexadecimal	Literal byte values
'X'	Single quotes	Literal ASCII characters
SOH	All caps	Non-printable ASCII characters
PageUp	Key name	key press-release sequence
shift↓	Key plus down arrow	Key-down only
shift↑	Key plus up arrow	Key-up only
esc | tab	Vertical bar	Alternatives (this or that)
$data_{opt}$	$_{opt.}$ (opt subscript)	Optional terminals and non-terminals
$packet\text{-}type_{nz}$	$_{nz}$ (nz subscript)	Applies to all packets except *z* type packets
$crc16_{nr}$	$_{nr}$ (nr subscript)	Applies to packets sent in "non-raw" mode, i.e., in "packet" mode

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3 Host to Reader Command Overview

This section is intended to introduce developers/users to the basic command types of the Reader. There are two ways to send a command to the Reader: from a Host computer, or by scanning a barcode containing a command sequence. In addition, there are two methods of sending a command from a Host computer to the Reader: packetized and text commands.

3.1 Packetized Commands

Packetized commands are the most reliable way to communicate to the Reader. The packet consists of a prefix and a suffix. The prefix contains the amount of data to be transmitted and the suffix contains error detection. Unlike text commands, packetized commands are always enabled. (See Section 6.2)

3.2 Text Commands

Text commands are provided as an easy way to send a command to a Reader but they lack the reliability of packetized commands. In addition, text commands must be enabled. Text commands can easily be sent from a terminal program and use a %xx (similar to URL encoding) to translate an escape sequence containing a 2-digit hex value corresponding to the single 8-bit ASCII character. This allows non-printable ASCII characters to be entered via the terminal program. Text commands can be sent via the RS232, USB Virtual COM (VCOM) or USB HID mode by using appropriate communication software. In addition, the developer/user may send text commands by using CRB files. (See Section 9)

3.3 Barcode Commands

The Reader will recognize the following sequence within a barcode as a command to the Reader:

SOH 'X' GS STX *Text-Command* **EOT** (Packet does not contain spaces)

The *Text-Command* portion contains a text command as described above.

Because the Barcode Command is terminated with ASCII EOT, the *Text-Command* may not contain EOT. If the *Text-Command* needs to contain EOT, encode it as %04.

3.4 Training

Code Corporation highly recommends attending technical training provided by Code via webinar and on site. This training is designed to provide in-depth knowledge/usage of the ICD for developers and users.

4 Communication Medium

The Reader communicates with the Host via USB (keyboard/HID/VCOM), RS232, Bluetooth, or WiFi. The Host includes appropriate hooks and/or drivers to enable two-way communication with the Reader.

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Note: USB keyboard communications are one-way, from the Reader to Host only. A special sequence is available to switch the Reader from keyboard to HID communication mode. See register 1B.

4.1 USB Enumeration PID (VID=11FA)

200 – KBD Mode
201 – IBM Handheld
202 – HID_Native
203 – Not used
204 – HID_VCOM
205 – CodeXML Modem HID Keyboard
206 – HID POS
207 – Bootloader
208 – CodeXML Modem HIDPOS
209 – CodeXML Modem HID Bulk
1009 - DFU

5 Reader to Host Communication

The Reader may be configured in raw mode, where no packet framing or check characters are sent, and packet mode (See sections 3.1 and 3.2) The Reader may also be configured to expect an acknowledgement from the Host after each packet and automatic retry when no acknowledgement is received. Standard "one-way" mode of operation uses raw packets, no expected response from Host, and no automatic retry. Standard "two-way" mode of operation uses packets with framing and checks characters, expects a response from the Host, and automatically resends. If no Acknowledgement is received (ACK), three (3) attempts to resend are made.

5.1 Raw Data

Reader to Host communication consists of decoded raw data having no framing or check characters. Raw data is sent with no "end of packet" data (crc16), expects no response from Host and no data is resent.

5.2 Packet Data

Data from the Reader to the Host consist of *packets* as specified below. Packetized data is sent using ACK/NAK protocols with framing and check characters. Packets are delivered asynchronously as barcodes are read and in response to Host to Reader commands. For keyboard communication (USB keyboard), all *ASCII-character*s are transmitted as *keyboard-sequence*s. For all other communication ports, all *ASCII-character*s are transmitted as *ASCII-byte*s.

Note: Even though the data size field allows up to 65535 bytes of data in a packet, the actual size of a packet either in raw or in packet mode including data and packet overhead is a maximum of 16384 bytes.

packet: *start packet-type*$_{nz}$ *data*$_{opt}$ *end*
start: *packet-start*$_{nr}$ **|** *codeXML-start*$_{nz}$
packet-start: **SOH 'X' 'R'** *protocol-version Reader-id packet-number timestamp data-size*
protocol-version: **'1'**
Reader-id: big-endian 32-bit number
packet-number: *data-packet-number* | *cmd-packet-number*

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data-packet-number:	any byte value in the range [0,7f]; increments with each packet; does not increment with resends; used with *z* and *a* packets only
cmd-packet-number:	any byte value in the range [80-ff]; increments with each packet; does not increment with resends; used with all packets other than *z* and *a*
timestamp:	big-endian 32-bit number, indicates timestamp in seconds (relative to Reader power-up) (For all but *z* packets, the timestamp represents the time the packet was sent to the Host; for *z* packets, the time the code was read.)
data-size:	big-endian 16-bit number indicating size of the *data* field (in bytes)
codeXML-start:	**SOH 'X' RS** *tag_response* ***'/'***
tag_response:	**'ap'**
packet-type:	Single ASCII-character in table below
data:	*character*
|	*data character*
character:	*byte*
|	*keyboard-sequence*
byte:	any byte value in range [**0x00**,**0xFF**]
keyboard-sequence:	*key*
|	**shift**↓ *key* **shift**↑
|	**alt**↓ *decimal-code* **alt**↑
key:	**~ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | - | =**
|	**q | w | e | r | t | y | u | i | o | p | [|] | **
|	**a | s | d | f | g | h | j | k | l | ; | '**
|	**z | x | c | v | b | n | m | , | . | /**
|	**space**
|	**esc | tab | shift | alt | ctrl | enter | backspace**
|	**f1 | f2 | f3 | f4 | f5 | f6 | f7 | f8 | f9 | f10 | f11 | f12**
|	**insert | delete | home | end | pageup | pagedown**
|	**left | right | up | down | keypadenter**
|	*digit*
decimal-code:	*digit | digit digit | digit digit digit* (range [0,255])
digit:	**keypad0** | **keypad1** | **keypad2** | **keypad3** | **keypad4**
|	**keypad5** | **keypad6** | **keypad7** | **keypad8** | **keypad9**
end:	*codeXML-end*$_{nz}$ *crc16*$_{nr}$
codeXML-end:	**EOT**

crc16: *big-endian 16-bit number* representing crc16 of the packet, calculated over the entire packet, excluding the crc16 itself. See source files *crc16.[hc]* in Appendix B for details on the crc16 algorithm and polynomials to be used.

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The following *packet-types* are defined:

a	Append decode data; indicates that *data* contains the first part of the decode data. A sequence of *'a'* packets always ends with a *'z'* packet. The data of all *'a'* packets in a group and the final *'z'* packet should be concatenated by the Host.
d	Done response; command and its associated data were successfully received; *data* optionally contains a null-terminated text message.
e	Error response; command was not successfully received; *data* optionally contains a null-terminated text message.
g	Start of a group of *'z'* packets to follow, terminated by a *'d'* or *'e'* packet (*'d'* for complete group, *'e'* for incomplete group)
i	indicates that data contains the zero-terminated Reader information string (of printable ASCII characters and TAB) in the following format: iVVVVWWWWXXXXSSSSSSSSSSAOODYYYYHHIIIIJJJJKKKKLLLL<TAB>Z…Z where: i indicates 'I' string output VVVV is the application firmware version number; WWWW is the core application firmware version number; XXXX is reserved; SSSSSSSSSS is the Reader's serial number (ten digits); A is the current execution state: "A" means core is running OO is the OEM identifier; D is the display type: "0" is no display device. YYYY is reserved; HH is the hardware revision; IIII is the hardware type identifier (value in register 21B); JJJJ is the boot application version; KKKK is the operating system kernel version; LLLL is the root file-system version; <TAB> is the ASCII TAB character; Z…Z is the OEM decoder version: a null terminated string of printable ASCII characters.
m	Message response; *data* contains a message (comment). *'m'* packets are not sent when the Reader is in "raw" mode.
r	Read code failure; decoder attempted but failed to read a code.
z	Decoded data from a code; *data* contains the data decoded from the code.

In "raw" mode (as opposed to "packet" mode), type **m** packets are not sent, only the decoded data is sent for type **z** packets, and all other packets are sent without the *packet-start* and *crc16* fields. In "packet-mode," the *packet-start* and *crc16* fields are always sent. (See Figure 1)

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Raw Mode						
*'**z**' (data) packet:*						
Data						
*(non-z) packet:example '**i**'*						
CodeXML® '**i**' response example						
CodeXML-start				packet-type	data	CodeXML-end
SOH	**'X'**	**RS**	**'ap/'**	**'i'**	VVV…	**EOT**

Packet Mode														
*'**z**' (data) packet:*														
packet-start								Data						packet-end
SOH	**'X'**	**'R'**	**'1'**	Reader ID (4 bytes)	packet number (1 byte)	time stamp (4 bytes)	data size (2 bytes)	data						crc16 (2 bytes)
*(non-z) packet:example '**i**'*														
packet-start								CodeXML® '**i**' response						packet-end
SOH	**'X'**	**'R'**	**'1'**	Reader ID (4 bytes)	packet number (1 byte)	time stamp (4 bytes)	data size (2 bytes)	**SOH**	**'X'**	**RS**	**'ap/'**	**'i'**	VVV…	**EOT**	crc16 (2 bytes)

Figure 1: Example 'z' and 'i' Packets in Raw and Packet Modes

Optionally, whenever the Host receives a packet, the Host will respond by sending a *Y* or *R* packet *(defined in the Host to Reader Communication section)* to the Reader. If the 'expect response' option is enabled in the Reader configuration, the Reader will repeatedly retransmit the packet (a configurable number of times) until it receives a *Y* packet.

If a packet received by the Host has a *packet-type* that is not any of the valid types listed above or has the same *packet-number* as the last processed packet of the corresponding type (command or data), the entire packet – up to and including *end* or until timeout – should be discarded by the Host. If the Host had requested a response, it should reissue the request.

If a packet received by the Host from the Reader fails its CRC, the Host should send an *R* packet to the Reader to request that the packet be resent.

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6 Host to Reader Communication

Commands and data from the Host to the Reader are sent in the form of *commands* as specified in this section.

Commands are normally sent in USB Native, VCOM, or RS232 modes. Commands may not be sent via keyboard modes.

Two command formats are supported: **text-command** and **packetized-command**. Text-command format is applicable to RS232 and VCOM modes but only if the Reader is configured to accept this format. Packetized-command format is applicable to all interfaces.

text-command: See Section 6.1.

packetized-command: See Section 6.2.

The command types are explained in Section 6.3.

After the Host sends each complete command, it should wait for a response packet from the Reader. Expected responses are specified along with the command types in section 6.3. If the Reader responds with an *'e'* packet or doesn't respond within a reasonable timeout period, the Host should resend the command a reasonable number of times.

6.1 Text Commands

Text commands may be sent to the Reader in RS232 or VCOM mode using any serial communications software (e.g., HyperTerminal).

Encoded-data is decoded by the Reader by replacing %xx by a single byte with the value specified by the two hex-digits xx- (e.g., **%25** would be replaced by character number 0x25, which is ASCII '**%**').

text-command: *command-type* *encoded-data*$_{opt}$ *carriage-return*
command-type: Single ASCII character in the set defined in Section 6.3
encoded-data: *encoded-datum*
| *encoded-data* *encoded-datum*
encoded-datum: *printable-character* | **%** *hex-digit hex-digit*
printable-character: any byte value in the range [0x20,0x7e]
hex-digit: **'0'** | **'1'** | **'2'** | **'3'** | **'4'** | **'5'** | **'6'** | **'7'** | **'8'** | **'9'**
| **'A'** | **'B'** | **'C'** | **'D'** | **'E'** | **'F'**
| **'a'** | **'b'** | **'c'** | **'d'** | **'e'** | **'f'**
carriage-return: **0x0d**

In order to eliminate inadvertent commanding of the Reader, Text Commands are disabled by default.

To enable Text Commands requires an initial sequence: *;>PAx* where *x* is as defined in section 8, register 41. (**Note:** 'A' is the ASCII character that corresponds to 41 HEX.)

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For example, to send the Reader commands by typing commands in HyperTerminal:

```
;>PA1
P(xx)yy
P(xx)yy
W
PA8
```

Where **;>PA1** enables text commands with echo and command responses, **P%xxyy** can be any desired commands, **W** saves the settings just sent by the P command, and **PA8** turns text commands back off (except for the initial sequence). (**Note:** *'A'* is the ASCII character that corresponds to 41 hex, thus P%418 would be equivalent.)

Note: ;>PA1 is used for interactive text commands. If the commands are to be saved in a file and sent non-interactively, use **;>PA7** instead; this enables text commands but disables echo and command responses. (See Section 6.3, Section 8, and Section 9 for additional information.)

With text commands enabled, the following two examples can be sent to a Reader in RS232 mode from HyperTerminal by just typing the example text.

Example 1 - Make the Reader beep/vibrate 3 times (**Note:** Readers with a vibration motor are the CR1400, CR2600, CR3600 and CR6000.):

#%03 *Expected output: should make Reader beep/vibrate 3 times*

Example 2 - Set Reader to continuous-read, High Density field (FOI 0) only:

P(C4)5 *Expected output: should set Reader to continuous-read, High Density field (FOI 0) only*

6.2 Packetized Commands

Packetized commands consist of packetized data sent from Host to Reader to configure and cause the Reader to perform certain functionalities (e.g. CodeXML® rules, and settings). Packetized commands are always enabled, unlike text commands. In addition, they include error detection data, making them more robust than text commands.

normal-command:	*prefix command-type data-size* $data_{opt}$ *reserved crc14*
prefix:	**0xEE 0xEE 0xEE 0xEE**
command-type:	Single ASCII character in the set defined in section 6.3
data-size:	byte value in range [0,240], which indicates size of *data* (in bytes)
data:	*datum*
|	*data datum*
datum:	any byte value in the range [0,255]
reserved:	**0x00**
crc14:	two consecutive bytes, each in range [0,127], representing the crc16 value & with the value 0x7F7F, most significant byte first. The packet crc16 is calculated over the entire packet, excluding the *prefix* and the crc14 itself. (See source files *Appendices B and C* for details on the crc16 algorithm and polynomials to be used, as well as how to implement appropriately for crc14 transmission.)

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6.3 Command Types

#	Causes the Reader to beep and vibrate the specified number of times; *data* contains the number as a single character in the range [0,127]. (The Reader will respond with *d* or *e*.) Example – beep three times: #%03 **Note:** Behavior is defined per platform. CR900FD/CR1000/CR2300/CR8000 – Beep three times. CR1400/CR2600/CR3600/CR6000 – Beep and vibrate three times. **Note:** Readers with a vibration motor are the CR1400, CR2600, CR3600 and CR6000.
$	Posts an event to the Reader; *data* contains the event number as a single character. See register 39 in Section 8 for a list of the event numbers. (The Reader will respond with *d* or *e*.)
(	Causes the Reader to upload any logged error messages (no *data*) (The Reader will respond with a *g* packet, zero or more *z* packets, and a final *d* or *e*. Each *z* packet contains a portion of the requested data in its *data* field. **Note:** This is very similar to the response to the X command; however, *p* packets are not applicable and the *g* and *d*/*e* packets are not suppressed even in raw mode.)
)	Causes the Reader to erase its log of error messages (no *data*) (The Reader will respond with *d* or *e*.)
,	Causes the Reader to send a list of current Reader settings (no *data*) (The Reader will respond with *d* containing a space-separated list of all setting values (in order, expressed as hexadecimal ASCII characters) or with *e*.) (see '<' command for saved Reader settings)
/	Toggle a bit (or bits) in a Reader setting; *data* contains a printable ASCII string in the following format: hexadecimal register number in parentheses followed by a 32-bit signed integer value, expressed in ASCII hexadecimal characters (with optional minus sign) or ASCII decimal characters preceded by the '#' character, e.g., /(2e)1000 or /(2e)#4096; the specified integer is XOR'ed with the existing setting value. The way a / command is handled is equivalent to a P command – the effects are immediate but won't survive a reboot. If you want the setting to be set after a reboot, issue a / then W or use the newer C/ combination. (The Reader will respond with *d* or *e*.) **Note:** see Section 8 for possible Reader settings.
1	Indicates the start of a file download; *data* is empty. This command is followed by a sequence of *2* commands containing the file data and a download-end command (e.g., *5*). (The Reader will respond with *d* or *e*.)

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2	Indicates a continuation of a file download; *data* contains the next portion of the file data. (The Reader will not send any response.)
5	Indicates the end of a regular file download; *data* contains the name of the file, which is from 1 to 200 letters, digits, periods, hyphens, and underscores, terminated with ASCII NUL. (The Reader will respond with *d, e,* or *f*.)
9	Requests the Reader to delete a file from its storage; *data* contains the file name, terminated with ASCII NUL.
;	Reserved (no operation – treated as a comment)
<	Causes the Reader to send a list of saved Reader settings (no *data*) (The Reader will respond with *d* containing a space-separated list of all setting values (in order, expressed as hexadecimal ASCII characters) or with *e*.)(see ',' command for current Reader settings)
=	Puts setting directly to Reader's non-volatile memory so that it will take effect upon next reboot; *data* is as defined in the / command; the specified integer replaces the existing setting value. **Note:** this command can be used to set communication modes without losing communication during the process. (The Reader will respond with *d* or *e*.) **Note:** The = command does not save changes immediately but those settings will be applied *after* a reboot. If you issue an =(2B)0 command to change the value of register 2B from 1, then until you reboot the value of 2B will still be 1. After you reboot the reader, the value of the 2B register will be 0 when the reader is ready again. In order to have that setting be immediate and survive a reboot you must either issue a P then a W command or use the newer C command. C(2B)0 is the same as these two commands combined: P(2B)0, W The = command is most useful to 'pre-set' a new communication mode that will become active *after* a reboot. (The Reader will respond with d or e.) **Note**: Also see commands O, P, Q, /, =, W. See Section 8 for possible Reader settings.
>	Causes the Reader to send a string of text to the Host as a *z* packet; *data* contains the text to send. (The Reader will respond with a *z* packet containing the text.)

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@	Causes the Reader to reset its internal date/timestamp to the specified time; *data* contains the date and/or time in one of the following formats. yyyy-mm-dd hh:mm:ss yyyy-mm-dd hh:mm hh:mm:ss hh:mm **Note:** the separators are optional; only digits are significant. (The Reader will respond with *d* or *e*.) Examples: Set to midnight: @00:00 Set to Sept 1, 2005 11:52:02 PM: @2005-09-01 23:52:02
A	Notifies the Reader that the previously sent data were rejected for one of the following reasons: • The packet was encrypted and the decryption failed. • The Host (CodeXML® Modem) is locked to a different Reader. The Reader should indicate to the user that the packet has been rejected; e.g., it may sound error beeps. See related register 12F: notify-of-packet-rejection. (The Reader will not respond to the Host.)
C	Apply a value to a register on the reader and save the value; data is in one of the following formats: (XXX)YYY where XXX is the register number and YYY is the setting value, both in ASCII hex. This will change the value in the register and save it. For example C(26)64 will change the value of register 26 to 0x64 and save this setting. /(XXX)YYY where XXX is the register number and YYY is the setting value, both in ASCII hex. This will toggle the bits in YYY and then save the resulting value (see / command). For example C/(1F7)40 will toggle bit 6 of register 1F7 and save this setting. O(XXX)YYY where XXX is the register number and YYY is the setting value, both in ASCII hex. This will set the bits in YYY (change those bits to 1s) for register XXX (see O command). For example CO(1F7)40 will set bit 6 of register 1F7 high and save this setting. Q(XXX)YYY where XXX is the register number and YYY is the setting value, both in ASCII hex. This will clear the bits in YYY (change those bits to 0s) for register XXX (see Q command). For example CQ(1F7)40 will clear bit 6 of register 1F7 and save this setting. **Note:** The C command saves changes immediately and those settings will survive a reboot. It is equivalent to issuing a P and =, then a W command. C(2B)0 is the same as these three commands combined: P(2B)0, =(2B)0, W (The Reader will respond with d or e.) **Note**: Also see commands O, P, Q, /, =, W. See Section 8 for possible Reader settings.

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<table>
<tr><td>G</td><td>Get setting from Reader if followed by a register number in parenthesis.

G([prefix|suffix]) will return the prefix or suffix text.

(The Reader will respond with d and the setting valueor with e. The setting value, if numeric, will be in hexadecimal, padded to 8 digits.)

Note: see Section 8 for possible Reader settings.</td></tr>
<tr><td>I</td><td>Requests the Reader to send its information string (no data).

(The Reader will respond with i or e.)

Optional Subcommands:
<table><tr><td>Is</td><td>Retrieves Settings data – Available in 911+ firmware
Is[scd]
s – saved settings (same as ‘<’ command)
c – current settings (same as ‘,’ command
d – default settings</td></tr><tr><td>Ib</td><td>Sends XML formatted battery information to Host.</td></tr></table></td></tr>
<tr><td>J</td><td>Requests the Reader to restore settings to defaults (no data).

(The Reader will respond with d or e.)</td></tr>
<tr><td>J1</td><td>Complete restore of factory setup. Will overwrite the apps and settings.</td></tr>
<tr><td>L</td><td>Requests the Reader to send a list of its stored files
data is:
(no data) or “0”; all non-hidden files.
“1”; hidden files
(The Reader will respond in the same manner as with the ‘(’ command, each z packet containing a file name as a NUL-terminated string of printable ASCII characters.)</td></tr>
<tr><td>N</td><td>Deletes all stored images (.jpg and .pgm) and buffered scan data (.log and .buf files)</td></tr>
<tr><td>O</td><td>Set a bit (or bits) in a Reader setting; data contains a printable ASCII string in the following format: hexadecimal register number in parentheses followed by a 32-bit signed integer value, expressed in ASCII hexadecimal characters (with optional minus sign) or ASCII decimal characters preceded by the ‘#’ character, e.g., /(2e)1000 or /(2e)#4096;; the specified integer is ORed with the existing setting value.

The way an O command is handled is equivalent to a P command – the effects are immediate but won’t survive a reboot. If you want the setting to be set after a reboot, issue an O then W or use the newer CO combination.

(The Reader will respond with d or e.)

Note: see Section 8 for possible Reader settings.</td></tr>
</table>

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P	Put a value in a Reader register; *data* contains a printable ASCII string in the following format: hexadecimal register number in parentheses followed by a 32-bit signed integer value, expressed in ASCII hexadecimal characters (with optional minus sign) or ASCII decimal characters preceded by the '#' character, e.g., /(2e)1000 or /(2e)#4096; the specified integer replaces the existing register value. (The Reader will respond with *d* or *e*.) **Note:** P(['prefix'|'suffix'])<URL encoded *text*> will set the prefix or suffix to *text*. Example: P(suffix)%01X%1ean//n%04 will create a CodeXML® sequence to send the scan code for the enter key. **Note:** The P command saves changes immediately but those settings will *not* survive a reboot. If you issue a P(2B)0 command to change the value of register 2B from 1, then reboot the reader, the value of the 2B register will be 1 when the reader is ready again. In order to have that setting survive a reboot you must either issue a P then a W command or use the newer C command. C(2B)0 is the same as these three commands combined: P(2B)0, W (The Reader will respond with d or e.) **Note**: Also see commands O, P, Q, /, =, W. See Section 8 for possible Reader settings.
Q	Clear a bit (or bits) in a Reader register; *data* contains a printable ASCII string in the following format: hexadecimal register number in parentheses followed by a 32-bit signed integer value, expressed in ASCII hexadecimal characters (with optional minus sign) or ASCII decimal characters preceded by the '#' character, e.g., /(2e)1000 or /(2e)#4096;; the ones-complement of the specified integer is AND'ed with the existing register value. The way a Q command is handled is equivalent to a P command – the effects are immediate but won't survive a reboot. If you want the setting to be set after a reboot, issue a Q then W or use the newer CQ combination. (The Reader will respond with *d* or *e*.) **Note**: Also see commands O, P, Q, /, =, W. See Section 8 for possible Reader settings.
R	Requests that the previously sent packet be re-sent by the Reader; *data* may specify a maximum packet size the receiver will accept: *data* is either empty or specifies a 16-bit big-endian unsigned integer (2 bytes). If *data* is empty or specifies a size less than 32 (the minimum packet size), the Reader will use its preferred maximum packet size. Otherwise, it will use the specified max packet size (or less) and will fragment data across multiple smaller packets when necessary. (The Reader will respond by resending its previous packet or with *e* if there was no previous packet. If the max data size has changed, it may resend the previous data in a sequence of more than one packet.)
T	Requests the current date and time (no *data*) (The Reader will respond with *d* with *data* containing the date and time formatted as yyyy-mm-dd hh:mm:ss.)

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W	Requests the Reader to write its current settings from RAM to its non-volatile memory. (The Reader will respond with *d* or *e*.) **Note:** The W command saves changes that have been make with a /, O, P or Q so those settings will survive a reboot. If you issue a P(2B)0 command to change the value of register 2B from 1, then reboot the reader, the value of the 2B register will be 1 when the reader is ready again. In order to have that setting survive a reboot you must either issue a P then a W command or use the newer C command. C(2B)0 is the same as these two commands combined: P(2B)0, W (The Reader will respond with d or e.) **Note**: Also see commands O, P, Q, /, =, W. See Section 8 for possible Reader settings.
Y	Acknowledge the receipt of a packet; *data* specifies the received packet number (one byte). (The Reader will not respond.)
Z	Request the Reader to reboot *data* is: • *empty* or '0'; reboot the Reader. • '1'; restart application. (The Reader will respond with *d* or *e* before it reboots.)
^	Requests the Reader to upload the specified stored file; *data* contains the file name, terminated with ASCII NUL. The Reader will respond with: 1. 'g' packet containing "*filename<tab>*(*size*)" 2. 'z' packet(s) 3. 'd' packet containing "EOF*<tab>*(*CRC16*)" **Note:** *filename* "help" is reserved to send command information.
_	Causes the Reader to wait for all buttons to be released and clear its event queue (The Reader will respond with *d* or *e*.)
|	Process *data* as a decoded string. (The Reader will respond with *d* or *e*.)

7 File Installation

7.1 Simple Protocol

The file is split into blocks of 236 or less bytes each and downloaded to the Reader via *1, 2, & 5* commands using the following sequence:

1) Send a *1* command to initialize the download.
2) Wait for a *d* or *e* response from the Reader or a timeout.
   a) If timeout or *e* response, restart the sequence at step 1.
   b) If *d* response, continue to step 3.

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3) Send a series of *2* commands, each with a portion of the file. (The Reader will not send any response.)
4) Send a *5* command to end the download and install the file.
5) Wait for a *d, e,* or *f* response from the Reader or a timeout.
    a) If *f* response or timeout, restart the sequence at step 1.
    b) If *e* response, repeat step 5.
    c) If *d* response, file download has completed successfully.

Note: the timeout will need to be increased from the normal response timeout to allow the firmware time to write the file to the flash memory.

8 Reader Settings

The Host sets the Reader settings using the */, C, O*, *P*, *Q,* and = commands and reads them using the *G,* ‘,’, and < commands.

For example, the following C command sets register 2E to the value 0x7F.

C(2E)7F

Note: for two-digit register numbers (i.e., settings 00 through FD), an alternative format may be used: in place of the parentheses and hexadecimal setting number, substitute a single character, which represents the setting number. The equivalent to the example above is

C.7F

The ASCII ‘.’ character has the hexadecimal value 0x2E. In certain circumstances, such as with text-commands, “percent-encoding” may be used for encoding a character as a sequence consisting of the percent character followed by two hexadecimal digits. With percent-encoding, the example may be expressed as

C%2E7F

In Section 8.3 below, the **Reg** column is the register number, in hexadecimal**,** to be used with the commands identified above. In the **Default** column, all values are in hexadecimal unless otherwise specified. To use decimal values in commands you must precede the data with a pound sign ‘#’. The following C command sets register 2E to the same value as the example above:

C(2E)#127

Since the single digit values of 0 through 9 are identical in decimal and hexadecimal, no indicator is needed.

8.1 Binary Dip Switch

Some registers are what Code terms a ‘Binary Dip Switch’ where the value of each bit of the data string switches on or off some part of the behavior of that register. The bits are numbered from least significant to most (a.k.a. right to left). Each bit can be on or off (1 or 0).

An example of this is register 0A, ‘NEC 2 of 5 Options’. The following settings are possible:

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Bit (R to L)	Controls	Value
0	NEC 2 of 5 Decoding	0: Disabled
		1: Enabled
1	Checksum checking	0: Disabled
		1: Enabled
2	Strip checksum from the result	0: Disabled
		1: Enabled
3	1 Digit Symbol Allowed	0: Disabled
		1: Enabled
4	2 Digit Symbol Allowed	0: Disabled
		1: Enabled

Given the settings above, the binary string to turn on NEC 2 of 5 decoding with checksum checking and the checksum stripped from the result string, allowing 2 digit symbols is 10111 (bits left to right). The same string would be 0x17 or decimal 23.

Thus, the command to implement the settings above would be:

C(0A)17

Or

C(0A)#23

8.2 Field of Interest

The reader optics are typically split into two separate fields - Field Of Interest 0 (FOI 0) and Field Of Interest 1 (FOI 1). In certain circumstances, these fields can be customized to the requirements of the user. In the default configuration of these fields FOI 0 is the High Density (HD) field and FOI 1 is the Wide (W) field.

At a given focus distance, the FOI 0 field is designed to read small, low-mil barcodes while the FOI 1 field is designed to pick up large, wide barcodes.

This document will refer to FOI 0 as HD and FOI 1 as Wide.

Note: The CR900FD is a single Field of Interest reader. There is no FOI 0 in the CR900FD.

8.3 Reader Settings Table

Reg	Setting Name	Default (Hex)	Comment

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<table>
<tr><th>Reg</th><th>Setting Name</th><th>Default (Hex)</th><th>Comment</th></tr>
<tr><td>00</td><td>Bluetooth® Radio Out-of-range indicator</td><td>0</td><td>Binary Dip Switch
<table>
<tr><th>Bit</th><th>Controls</th><th>Value</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">Vibrate</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Beep</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
</table>
Note: Readers with a vibration motor are the CR1400, CR2600, CR3600 and CR6000.</td></tr>
<tr><td>04</td><td>Continuous Illumination During Read</td><td>0</td><td>0: Minimal Illumination (Illumination stops whenever not needed during the Read Cycle – this produces a little more flashing but reduces power consumption to a degree)
1: Leave Illumination On Until End of the Read Cycle

Leave illumination on during read</td></tr>
<tr><td>05</td><td>USB Declaration Wait State</td><td>0</td><td>0: Declare enumeration after receipt of set LED status report
1: Declare enumeration after receipt of get report descriptor command (used for some Windows CE-based devices)

Special case for USB enumeration that doesn’t require Host keyboard response</td></tr>
<tr><td>08</td><td>Reader Packet Format</td><td>1</td><td>1: Raw Mode
2: Packet Mode
4: Encrypted Packet Mode (Version 2)
5: AES Encryption Mode (Version 4)
6: Safe Upgrade Mode (Version 1)

This setting is used in conjunction with registers 1B and 42 to configure the communication mode between standard “one-way” and “two-way” modes.

For example, USB “two-way” native:
1B: 5 (USB Native)
08: 2 (packet mode)
42: 1 (expect response)

Also see registers: 1B, 42</td></tr>
</table>

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<table>
<tr><th>Reg</th><th>Setting Name</th><th>Default (Hex)</th><th>Comment</th></tr>
<tr><td>0A</td><td>NEC 2 of 5 Symbology</td><td>0</td><td>Binary Dip Switch
<table>
<tr><th>Bit</th><th>Controls</th><th>Value</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">NEC 2 of 5 Decoding</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Checksum checking</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Strip checksum from the result</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
</table></td></tr>
<tr><td>0B</td><td>Matrix 2 of 5 Symbology</td><td>0</td><td>Binary Dip Switch
<table>
<tr><th>Bit</th><th>Controls</th><th>Value</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">Matrix 2 of 5 Decoding</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Checksum checking</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Strip checksum from the result</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
</table></td></tr>
<tr><td>0C</td><td>Telepen Symbology</td><td>0</td><td>0: Disabled
1: Enabled</td></tr>
<tr><td>0F</td><td>Targeting Contro</td><td>1</td><td>0: Targeting Disabled
1: Targeting Enabled</td></tr>
<tr><td>13</td><td>1D Barcode Aggressiveness</td><td>0</td><td>0: Most Aggressive
1: Less Aggressive
2: Least Aggressive

Use this feature to minimize misreads on poorly printed 1D barcodes

Note: This feature requires firmware 956+ and CD 13.2.x+.</td></tr>
<tr><td>14</td><td>Image Transform</td><td>0</td><td>0: No Transform
1: Mirror – Enables decoding of mirrored Data Matrix, QR, Han Xin, and Aztec symbologies. Those symbologies must be enabled.</td></tr>
<tr><td>16</td><td>Data Matrix Rectangular Symbology</td><td>1</td><td>0: Disabled
1: Enabled

Note: This register has no effect on a CR900FD without the proper 2D barcode decoding license.</td></tr>
</table>

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<table>
<tr><th>Reg</th><th>Setting Name</th><th>Default (Hex)</th><th>Comment</th></tr>
<tr><td>19</td><td>Data Matrix Symbology</td><td>3</td><td>Binary Dip Switch
<table>
<tr><th>Bit</th><th>Controls</th><th>Value</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">Data Matrix Decoding</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Inverse Data Matrix Decoding</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Mirror Data Matrix Decoding</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
</table>
Note: This register has no effect on a CR900FD without the proper 2D barcode decoding license.</td></tr>
<tr><td>1A</td><td>Straight 2 of 5 Symbology</td><td>0</td><td>0: Disabled
1: Enabled

Straight 2 of 5 (with 2 or 3 start/stop codes) Decoding.

Note: Straight 2 of 5 with 2 start/stop is also called IATA 2 of 5. Straight 2 of 5 with 3 start/stop is also called Industrial 2 of 5. CD12.3.0 supports Industrial 2 of 5. CD 13.1.4 supports IATA 2 of 5.</td></tr>
</table>

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Reg	Setting Name	Default (Hex)	Comment
1B	Communications Mode	USB decode board: 2 RS232 decode board: 1 CR2300: CR2600: CR3600: 5 CR4405: C (#12)	1: RS232 Serial 2: USB Keyboard 3: USB IBM POS 4: Bluetooth (SPP) 5: USB Native (HID) 6: USB Virtual COM 7: USB HID POS -Terminal 131 9: Wi-Fi A (#10): Bluetooth Keyboard B (#11): iOS® External Accessory mode C (#12): iOS® Keyboard Mode D (#13): iOS® USB Pass through Mode This setting is used in conjunction with registers 08 and 42 to configure the communication mode between standard “one-way” and “two-way” modes. For example, USB “two-way” native: 1b: 5 (USB Native) 08: 2 (packet mode) 42: 1 (expect response) **Note: To switch from USB keyboard mode to Downloader mode (HID), the following must be completed within 1 second:** • first output report with num lock set and caps lock clear • second output report with num lock set and caps lock clear • third output report with caps lock set and num lock clear • fourth output report with caps lock set num lock clear • fifth output report with num lock set and caps lock clear • sixth output report with num lock set and caps lock clear On the last output report comm protocol is set to raw mode, comm expect response is false and comm mode is USB Downloader (HID) mode. Also see registers: 08, 42
1C	Serial Baud Rate	1C200 (#115200)	All standard baud rates up #115200 • 2580 (#9600) • 4B00 (#19200) • 9600 (#38400) • E100 (#57600) • 1C200 (#115200) Also see registers: 1D, 1E, 1F, 22

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Reg	Setting Name	Default (Hex)	Comment
1D	Serial Stop Bits	1	1: Send 1 Stop Bit 2: Send 2 Stop Bits Also see registers: 1C, 1E, 1F, 22
1E	Serial Data Bits	8	7: 7 Data Bits 8: 8 Data Bits Also see registers: 1C, 1D, 1F, 22
1F	Serial Flow Control	0	0: Disabled 1: Hardware Also see registers: 1C, 1D, 1E, 22
22	Serial Parity	0	0: None 1: Odd 2: Even Also see registers: 1C, 1D, 1E, 1F
26	Beep Volume (percent)	64 (#100)	Valid Range: 0 to 64 (#100) Percent This is the current percentage of full volume potential. Also see registers: 59, A7, 1F1
29	PDF417 Symbology	1	0: Disabled 1: Enabled **Note:** This register has no effect on a CR900FD without the proper 2D barcode decoding license. Also see registers: 2A, CF
2A	Micro PDF417 Symbology	0	0: Disabled 1: Enabled **Note:** This register has no effect on a CR900FD without the proper 2D barcode decoding license. Also see registers: 29, CF

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<table>
<tr><th>Reg</th><th>Setting Name</th><th>Default (Hex)</th><th>Comment</th></tr>
<tr><td>2B</td><td>QR Code Symbology</td><td>1</td><td>Binary Dip Switch
<table>
<tr><th>Bit</th><th>Controls</th><th>Value</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">QR Code Standard Decoding</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">QR Code Inverse Decoding</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Micro QR Code Decoding</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Unused</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">QR Code Mirror Decoding</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Model 1 QR Code Decoding</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
</table>
Note: This register has no effect on a CR900FD without the proper 2D barcode decoding license.
Micro must have Standard enabled to be enabled and Mirror must have Standard or Micro enabled to be enabled. Inverse works independently of Standard QR.
CD13.1.5+ supports Model 1 even though Model 1 is considered obsolete.</td></tr>
</table>

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Reg	Setting Name	Default (Hex)	Comment
2C	Active Mode Countdown Timer (ms) Bluetooth: Extra Cabled Active Time Timer (ms)	2710 (#10000)	Valid Range: 0 to 7FFFFFFF Milliseconds. This state: Active (Highest power usage) Next state: Idle Counts down to the end of Active Mode. To disable this timer, set the register value to -1 as in the following example which disables and saves the timer setting with the 'C' command: C(2C)#-1 Active Mode is the time between the last user interaction with the Reader (button press, etc.) or firmware interaction (communications, etc) and the end of the Active Mode Countdown Timer. There are many user and firmware events that will reset the timer; therefore it may seem that the timer is longer than the value set. Bluetooth readers: This timer only applies if in the charging unit and will get added to register 32 to get the time to idle state from active mode. Also see registers: 32, 88, 8E, 9F, 2C, 9E
2D	Keyboard Maps	0	0: US English (without leading 0 in the ALT + number) 1: ASCII (ALT+number) - universal 2: Custom (requires user to download keyboard map) 3: US English (with leading 0 in the ALT + number for non-printable ASCII) 4: French Keyboard 5: German Keyboard 6: Japanese Keyboard 7: US English (with CTRL + char for non-printable ASCII) 8: Swiss Keyboard 9: Belgian Keyboard A (#10): UK Keyboard B (#11): Latin American Keyboard **Note:** See 14 Appendix: Custom Keyboard XML File Formatting

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Reg	Setting Name	Default (Hex)	Comment
32	Idle Mode Countdown Timer (ms) Bluetooth readers: Active Mode Countdown Timer (ms)	64 (#100)	Valid Range: 0 to 7FFFFFFF Milliseconds. This state: Idle (Mid power usage) Next state: Standby Counts down to the end of Idle Mode. To disable this timer, set the register value to -1 as in the following example which disables and saves the timer setting with the 'C' command: C(32)#-1 Idle Mode is the time after the Active Mode Countdown Timer has expired and before the Idle Mode Countdown Timer has expired. There are many user and firmware events that will reset the timer or send the reader back into a higher-power mode; therefore it may seem that the timer is longer than the value set. Bluetooth readers: This is the time from active mode to idle mode when the unit is not in the charger. If in the charger, this gets added to register 2C to get the time from active to idle. Bluetooth readers this state: Active (High power usage) Bluetooth readers next state: Idle Also see registers: 32, 88, 8E, 9F, 2C, 9E
33	Target Time Before Decode (ms)	0	Valid Range: 0 to 7FFFFFFF Milliseconds This is the time between a trigger event and when the reader will capture an image. It is useful for positioning the reader over a specific barcode among multiple barcodes.
34	Maximum Candidate Decodes Per Read	1	The Reader will process up to this number of codes per "read code" event. If there are more than this many codes in the field of view and within target tolerance, only the first ones will be decoded. For fastest performance with single codes, set to 1. Also see registers: 4A, D8, DB
35	Button Stay-Down Time (ms)	0	Valid Range: 0 to 7FFFFFFF Milliseconds Keep processing the "read code" events for this amount of time (act as if the button stays down for this time) With version 268+, this register is not used with motion detect. Also see register: 21A
37	Host Acknowledgement Time Limit (ms)	2BC (#700)	Valid Range: 0 to 7FFFFFFF Milliseconds After sending data to Host, the Reader waits up to this amount of time for the acknowledgement from Host before declaring failure.

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Reg	Setting Name	Default (Hex)	Comment
39	Trigger 1	3	The specified event is posted upon press of this button. For the CR2600 and CR2300, trigger 1 is the button towards the back on the top of the reader. For the CR3600, trigger 1 is the button to the left of the center navigation buttons. See the description for Register C4 for a list of valid events.
3A	Trigger 2	3	For the CR2600 and CR2300, trigger 2 is the button towards the front on the top of the reader. For the CR3600, trigger 2 is the button to the right of the center navigation buttons. Also see register 39
3B	Trigger 3	0	The combination of pressing buttons defined by trigger 1 and trigger 2 being pressed simultaneously. Also see register 39
3C	Trigger 4	3	For the CR2600, CR2300, and CR3600, trigger 4 is the handle trigger. Also see register 39
3D	Trigger 5	0	The combination of pressing buttons defined by trigger 1 and trigger 4 being pressed simultaneously. Also see register 39
3E	Trigger 6	0	The combination of pressing buttons defined by trigger 2 and trigger 4 being pressed simultaneously. Also see register 39
3F	Trigger 7	0	The combination of pressing buttons defined by trigger 1, trigger 2 and trigger 4 being pressed simultaneously. Also see register 39
40	Text Command Timeout (ms)	2AF8 (#11000)	Valid Range: 0 to 7FFFFFFF Milliseconds The maximum time during which a complete text command from Host must be received. (Pending text command data is discarded when the timeout is exceeded.)

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<table>
<tr><th>Reg</th><th>Setting Name</th><th>Default (Hex)</th><th>Comment</th></tr>
<tr><td>41</td><td>Text Commands</td><td>8</td><td>Binary Dip Switch
<table>
<tr><th>Bit</th><th>Controls</th><th>Value</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">Text Commands</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Suppress Echo</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Suppress Responses</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Disable Text Commands but Enable Magic Sequence; See Below</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Suppress URL Decode; See Below</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Accept On Timeout</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
</table>
Magic Sequence:
The Magic Sequence is the string “;>PAx” where x is 1, 3, or 7 as defined above. This would normally be used in command text files, which would begin with the text-command-on sequence and end with the command to return to this special mode. For example:
;>PA7
;any desired commands here
PA8
Suppress URL Decode:
For example, if enabled, P%418 will not equal PA8. The % is not recognized as an escape character
Accept On Timeout:
Note: See register 156 for details</td></tr>
</table>

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<table>
<tr><th>Reg</th><th>Setting Name</th><th>Default (Hex)</th><th>Comment</th></tr>
<tr><td>42</td><td>Expect Acknowledgement From Host</td><td>0</td><td>0: Reader doesn’t wait for acknowledge
1: Reader will retransmit data when Host doesn’t acknowledge receipt

This setting is used in conjunction with registers 08 and 1B to configure the communication mode between standard “one-way” and “two-way” modes.

For example, USB “two-way” native:
1B: 5 (USB Native)
08: 2 (packet mode)
42: 1 (expect response)

Also see registers: 08, 1B</td></tr>
<tr><td>43</td><td>JPEG Picture Quality (percent)</td><td>32
(#50)</td><td>Valid Range: 0 to 64 (#100) Percent

0: Raw Image (No JPEG Compression)
1 To 100: JPEG Compression Quality Percent

Also see registers: 36, AB, AC, AD, AE, AF, B1</td></tr>
<tr><td>46</td><td>Prefix With Timestamp</td><td>0</td><td></td></tr>
<tr><td>47</td><td>MaxiCode Symbology</td><td>0</td><td>Binary Dip Switch
<table>
<tr><th>Bit</th><th>Controls</th><th>Value</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">MaxiCode Decoding, Mode 0</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">MaxiCode Decoding, Mode 1</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">MaxiCode Decoding, Mode 2</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">MaxiCode Decoding, Mode 3</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">MaxiCode Decoding, Mode 4</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">MaxiCode Decoding, Mode 5</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">MaxiCode Decoding, Mode 6</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
</table>
Note: This register has no effect on a CR900FD without the proper 2D barcode decoding license.</td></tr>
</table>

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<table>
<tr><th>Reg</th><th>Setting Name</th><th>Default (Hex)</th><th>Comment</th></tr>
<tr><td>48</td><td>Codabar Checksum</td><td>0</td><td>Binary Dip Switch
<table>
<tr><th>Bit</th><th>Controls</th><th>Value</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">Codabar Checksum Checking</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Strip Checksum From Output</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
</table></td></tr>
<tr><td>49</td><td>Code 39 Full ASCII Symbology</td><td>0</td><td>0: Disabled
1: Enabled

Code 39 Full ASCII Decoding</td></tr>
<tr><td>4A</td><td>Composite Codes</td><td>0</td><td>0: Disabled
1: Enabled

Composite Code Decoding

Also see registers: 34, D8, DB</td></tr>
<tr><td>4B</td><td>Postal Code Symbology</td><td>0</td><td>Binary Dip Switch
<table>
<tr><th>Bit</th><th>Controls</th><th>Value</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">USPS Postnet</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">USPS Planet</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">USPS Intelligent Mail</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Australia Post</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Dutch Post (KIX)</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Japan Post</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">UK Royal Mail</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">7</td><td rowspan="2">UPU ID-tags</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
</table></td></tr>
</table>

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<table>
<tr><th>Reg</th><th>Setting Name</th><th>Default (Hex)</th><th>Comment</th></tr>
<tr><td>4C</td><td>GS1 DataBar™ Symbology</td><td>1F
(#31)</td><td>Binary Dip Switch
<table>
<tr><th>Bit</th><th>Controls</th><th>Value</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">GS1 DataBar™ Expanded decoding</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">GS1 DataBar™ Expanded Stacked decoding</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">GS1 DataBar™ Limited decoding</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">GS1 DataBar™ Omnidirectional and GS1 DataBar™ Truncated decoding</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">GS1 DataBar™ Stacked and GS1 DataBar™ Stacked Omnidirectional decoding</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
</table></td></tr>
<tr><td>4D</td><td>UPC Expansion</td><td>0</td><td>0: Disabled
1: Enabled

This register enables converting UPC-E output to UPC-A format

Also see registers: 4E, 6A, 74</td></tr>
<tr><td>4E</td><td>UPC Supplemental</td><td>0</td><td>0: Disabled
1: Enabled

This register enables concatenating a standard UPC with the secondary supplemental UPC data (two or five digits), when present.

Also see registers: 4D, 6A, 74</td></tr>
</table>

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<table>
<tr><th>Reg</th><th>Setting Name</th><th>Default (Hex)</th><th>Comment</th></tr>
<tr><td>4F</td><td>MSI Plessey Symbology</td><td>0</td><td>Binary Dip Switch with bits 1-3 comprising one value
<table>
<tr><th>Bit</th><th>Controls</th><th>Value</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">MSI Plessey</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="8">Bits 1-3
This is a value based setting.
Calculate and compare checksums of this type and/or strip the checksum (See examples below)</td><td colspan="2">0: Disabled checksum checking</td></tr>
<tr><td colspan="2">1: One Byte Modulus 10</td></tr>
<tr><td colspan="2">2: One Byte Modulus 10 & One Byte Modulus 11</td></tr>
<tr><td colspan="2">3: Two Bytes Modulus 10</td></tr>
<tr><td colspan="2">4: reserved</td></tr>
<tr><td colspan="2">5: One byte Modulus 10 then strip</td></tr>
<tr><td colspan="2">6: check modulus 10 & 11 then strip</td></tr>
<tr><td colspan="2">7: check two modulus 10 then strip</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">UK Plessey (original)</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
</table>
Examples: To decode MSI Plessey CD13.2.10+:
• MSI Mod10: set 4F to 3 (hex)
• MSI Mod11/10: set 4F to 5 (hex)
• MSI Mod10/10: set 4F to 7 (hex)
• MSI Mod10 with strip, set 4F to B (hex)
• MSI Mod11/10 with strip: set 4F to D (hex)
• MSI Mod10/10 with strip: set 4F to F (hex)</td></tr>
<tr><td>50</td><td>Aztec Symbology</td><td>1</td><td>Binary Dip Switch
<table>
<tr><th>Bit</th><th>Controls</th><th>Value</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">Aztec Decoding</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Inverse Aztec Decoding</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Mirror Aztec Decoding</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
</table>
Note: This register has no effect on a CR900FD without the proper 2D barcode decoding license.</td></tr>
</table>

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<table>
<tr><th>Reg</th><th>Setting Name</th><th>Default (Hex)</th><th>Comment</th></tr>
<tr><td>53</td><td>Decoder HD field (FOI 0) Width</td><td>280 (#640)</td><td>Valid Range: 1 to 640 pixels

Decoder uses only the specified pixel width in the HD field (FOI 0). See section 8.2

Note: The High Density field (FOI 0) does not exist on the CR900FD.</td></tr>
<tr><td>54</td><td>Decoder HD field (FOI 0) Height</td><td>3C0 (#960)</td><td>Valid Range: 1 to 960 pixels

Decoder uses only the specified pixel height in the HD field (FOI 0). See section 8.2

Note: The High Density field (FOI 0) does not exist on the CR900FD.</td></tr>
<tr><td>55</td><td>Notify Of Read Failure</td><td>0</td><td>0: Disabled
1: Send “r” packet on no-read (See “r” packet in Section 5.2)
0x100xx: post event on no-read, where the lower 8 bits specify the event number. For example, 0x10009 to post Event 0x09.

Also see register 39 for a list of events.</td></tr>
<tr><td>59</td><td>Beep Duration</td><td>64 (#100)</td><td>Valid Range: 0 to 7FFFFFFF Milliseconds

Also see registers: 26, A7, 1F1</td></tr>
<tr><td>6A</td><td>UPC/EAN Symbology</td><td>1</td><td>0: Disabled
1: Enabled

Note: Enables and disables all UPC and EAN codes (UPC-A, UPC-E, EAN-13, EAN-8)

Also see registers: 4D, 4E, 74</td></tr>
<tr><td>6B</td><td>Code 39 Symbology</td><td>1</td><td>Binary Dip Switch
<table><tr><th>Bit</th><th>Controls</th><th>Value</th></tr><tr><td rowspan="2">0</td><td rowspan="2">Enable/Disable Code 39</td><td>0: Disabled</td></tr><tr><td>1: Enabled</td></tr><tr><td rowspan="2">1</td><td rowspan="2">Enable/Disable Code 32</td><td>0: Disabled</td></tr><tr><td>1: Enabled</td></tr></table>Code 32 is also known as Italian Pharmacode. It uses the same encoding as Code 39 and can be decoded as Code 39 with unintended data when Code 32 is not enabled. It is not necessary to enable Code 39 to enable Code 32.

Also see register: 70</td></tr>
<tr><td>6C</td><td>Code 93 Symbology</td><td>1</td><td>0: Disabled
1: Enabled</td></tr>
<tr><td>6D</td><td>Code 128 Symbology</td><td>1</td><td>0: Disabled
1: Enabled</td></tr>
</table>

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<table>
<tr><th>Reg</th><th>Setting Name</th><th>Default (Hex)</th><th>Comment</th></tr>
<tr><td>6E</td><td>Interleaved 2 Of 5 Symbology</td><td>1</td><td>0: Disabled
1: Enabled

Also see registers: 71, C9</td></tr>
<tr><td>6F</td><td>Codabar Symbology</td><td>1</td><td>0: Disabled
1: Enabled</td></tr>
<tr><td>70</td><td>Code 39 Checksum</td><td>0</td><td>Binary Dip Switch
<table><tr><th>Bit</th><th>Controls</th><th>Value</th></tr><tr><td rowspan="2">0</td><td rowspan="2">Code 39 Checksum Checking</td><td>0: Disabled</td></tr><tr><td>1: Enabled</td></tr><tr><td rowspan="2">1</td><td rowspan="2">Strip Checksum From Output</td><td>0: Disabled</td></tr><tr><td>1: Enabled</td></tr></table>
Also see register: 6B</td></tr>
<tr><td>71</td><td>Interleaved 2 Of 5 Checksum</td><td>0</td><td>0: Disable checksum checking
1: Enable checksum checking
2: Enable checksum checking and strip the checksum from the result string

Also see registers: 6E, C9</td></tr>
<tr><td>72</td><td>Auto Stored Data Erase (Auto Log Erase)</td><td>1</td><td>0: Disable
1: Enable

Note: When Enabled, data and images are cleared from nonvolatile memory when they are successfully uploaded to the Host. (In “Log mode,” this is set to Disabled).

Note: Only applies to readers using Bluetooth communication modes.

Also see registers: 73, 76</td></tr>
<tr><td>73</td><td>Auto Buffer Upload</td><td>1</td><td>0: Disable
1: Enable

When Enabled, the Reader will automatically upload buffered data (i.e. storage that hasn’t been previously uploaded) whenever a connection is present.

Note: Only applies to readers using Bluetooth communication modes.

Also see registers: 72, 76</td></tr>
<tr><td>74</td><td>UPC Short Margin</td><td>1</td><td>0: Disabled
1: Enabled

Also see registers: 4D, 4E, 6A</td></tr>
</table>

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<table>
<tr><th>Reg</th><th>Setting Name</th><th>Default (Hex)</th><th>Comment</th></tr>
<tr><td>76</td><td>Send And Store Mode</td><td>0</td><td>0: Normal mode (buffered send)
1: Send and log mode
3: Log only mode

Note: Only applies to readers using Bluetooth communication modes.

Also see register: B4. Reader will not allow the user to set auto-reconnect on, and store data. If any setting that allows storing data is turned on, auto-reconnect will be turned off (if it is on).</td></tr>
<tr><td>78</td><td>Settings Lock</td><td>1</td><td>1: Settings unlocked
3: Settings locked (except settings Lock)</td></tr>
<tr><td>85</td><td>Tri-Optic Options</td><td>0</td><td>Binary Dip Switch
<table><tr><th>Bit</th><th>Controls</th><th>Value</th></tr><tr><td rowspan="2">0</td><td rowspan="2">Tri-Optic Decoding, Normal Quiet Zones</td><td>0: Disabled</td></tr><tr><td>1: Enabled</td></tr><tr><td rowspan="2">1</td><td rowspan="2">Allow Short Quiet Zones</td><td>0: Disabled</td></tr><tr><td>1: Enabled</td></tr><tr><td rowspan="2">2</td><td rowspan="2">No Quiet Zones Required</td><td>0: Disabled</td></tr><tr><td>1: Enabled</td></tr><tr><td rowspan="2">3</td><td rowspan="2">Reverse order of first and second halves</td><td>0: Disabled</td></tr><tr><td>1: Enabled</td></tr></table>
Note: Bit 3 is supported in CD 14.1.2+</td></tr>
<tr><td>86</td><td>Motion Detection: Event</td><td>3</td><td>Valid Range: Any event as defined in register 39 and re-listed in C4

Motion detection is enabled by setting register C4 to 0xF0.

This register is reset to 0 (disabled) when register C4 is changed away from 0xF0. When motion is detected, this event is posted.

See register 39 or C4 for list of events.

Also see registers: 204, 20E</td></tr>
</table>

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Reg	Setting Name	Default (Hex)	Comment
88	Sleep Timeout (sec)	CR2300: CR2600: CR3600: A8C0 (#43200, 12 hours)	Valid Range: 0 to 7FFFFFFF Milliseconds. This state: Sleep (Lowest power usage) Next state: Power off Counts down to the end of Sleep Mode and then the device powers off. To disable this timer, set the register value to -1 as in the following example which disables and saves the timer setting with the 'C' command: C(88)#-1 **Note:** Only applies to readers using Bluetooth communication modes. Also see registers: 32, 88, 8E, 9F, 2C, 9E
8C	USB Virtual Communications Common Mode	1	0: Disabled 1: Enabled Every reader with USB Virtual Communications Common Mode enabled will use a common VCOM port on the host PC. A reader with this setting disabled will use a unique VCOM port. **Note:** This setting is only valid for CR8000/1000/1400/900FD/6000 and can be enabled only with PC VCOM Driver 2.1.0 or above and Reader firmware 0956 and above.
8E	Time In Idle Mode (ms)	CR2300: CR2600: CR3600: 1388 (#5000)	Valid Range: 0 to 7FFFFFFF Milliseconds This register defines the amount of time in Idle Mode before entering Standby Mode. Other than the quicker transition to Active Mode, the Reader is in a state very similar to Standby Mode. Communications: Enabled Current state: Idle (Mid power usage) Next state: Standby **Note:** Only applies to readers using Bluetooth communication modes. Also see registers: 32, 88, 8E, 9F, 2C, 9E

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Reg	Setting Name	Default (Hex)	Comment
93	Suppress Beep On Decode	0	0: Beep indicating decode before JavaScript processing 1: Call JavaScript without beeping to indicate decode Normally, the Reader beeps as soon as decodes are read and processes them via JavaScript if necessary *after* the beep. To enable JavaScript to control the beep feedback, change this setting to 1; this will suppress the beep; the JavaScript would typically beep if the decode is valid or start another read cycle if it isn't. This setting does not suppress beeps for anything but a successful decode event.
98	Decoder HD field (FOI 0) X Offset	0	Valid Range: 0 to 639 pixels Decoder uses the pixels after the specified pixel offset in the HD field (FOI 0). See section 9.2 **Note:** The High Density field (FOI 0) does not exist on the CR900FD.
99	Decoder HD field (FOI 0) Y Offset	0	Valid Range: 0 to 959 pixels Decoder uses the pixels after the specified pixel offset in the HD field (FOI 0). See section 9.2 **Note:** The High Density field (FOI 0) does not exist on the CR900FD.
9A	Decoder Wide field (FOI 1) X Offset	0	Valid Range: 0 to 639 pixels Decoder uses the pixels after the specified pixel offset in the Wide field (FOI 1). See section 9.2
9B	Decoder Wide field (FOI 1) Y Offset	0	Valid Range: 0 to 959 pixels Decoder uses the pixels after the specified pixel offset in the Wide field (FOI 1). See section 9.2
9D	Target Tolerance (percent)	640 (#1600)	Valid Range: 0 to 7FFFFFFF Percent For the Reader to accept a barcode, the barcode must be within a certain distance from the center of the image. The distance is defined as a percentage of the barcode's smaller dimension. For example, with a 10 x 20 mm barcode and a setting of 150 (%), the barcode must be within 15 mm of the center of the image. Any value over #1000 is considered infinite tolerance, and no target checking is performed.

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Reg	Setting Name	Default (Hex)	Comment
9E	Extra Cabled Idle Time	CR2300: CR2600: CR3600: 2710 (#10000) CR4405: #-500	This is the time added to the idle timeout register 8E if unit is in the charger. To disable this timer, set the register value to -1 as in the following example which disables and saves the timer setting with the 'C' command: C(9E)#-1 Current State: Idle Next State: Standby **Note:** Only applies to readers using Bluetooth communication modes. Also see registers: 32, 88, 8E, 9F, 2C, 9E
9F	Standby Mode Countdown Timer (ms)	FFFFFE0C (#-500) CR2300: CR2600: CR3600: 927C0 (#600000, 10 min) CR4405: EA60 (#60000, 1 min)	Valid Range: 0 to 7FFFFFFF Milliseconds. This state: Standby (Lowest power usage) Next state: Sleep (< 2mA current – NON-USB devices ONLY) Counts down to the end of Standby Mode. (Sleep mode NOT active in cabled USB devices). To disable this timer, set the register value to -1 as in the following example which disables and saves the timer setting with the 'C' command: C(9F)#-1 Standby Mode is the time after the Idle Mode Countdown Timer has expired and before the Standby Mode Countdown Timer has expired. There are many user and firmware events that will reset the timer or send the reader back into a higher-power mode; therefore it may seem that the timer is longer than the value set. **Note:** Only applies to readers using Bluetooth communication modes. Also see registers: 32, 88, 8E, 9F, 2C, 9E
A1	Vibrate	1	0: Disabled 1: Enabled (vibration motor will be on at same time as speaker) **Note:** if vibrate-only is desired, set speaker volume to 0 using register 26. **Note:** Readers with a vibration motor are the CR1400, CR2600, CR3600 and CR6000.

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Reg	Setting Name	Default (Hex)	Comment
A2	Default Event Delay (ms)	64 (#100)	Valid Range: 0 to 7FFFFFFF Milliseconds The Reader will pause for this amount of time between each posting of the default event (used with “continuous read” mode). Also see register: C4
A7	Beep (Vibrate) Pulse Separation (ms)	64 (#100)	Valid Range: 0 to 7FFFFFFF Milliseconds The spacing in milliseconds between beeps when beeping multiple times. **Note:** Readers with a vibration motor are the CR1400, CR2600, CR3600 and CR6000. Also see registers: 26, 59, 1F1
AB	AGC Selection for Picture Taking	0	0: Use decoder AGC (designed for Symbology decoding) 1: Use imager AGC (optimized for pictures) Also see registers: 36, 43, AC, AD, AE, AF, B1
AC	Wide field (FOI 1) Picture Window Left Position	0	Specify left edge of window used with “take picture.” The position and size are relative to the virtual image (i.e., not the rotated physical image). **Note:** On a Code Reader, overall image is 960 pixels by 1280 pixels. Upper half is Wide field (FOI 1); lower half is High Density (FOI 0). The High Density field (FOI 0) does not exist on the CR900FD. Also see registers: 36, 43, AB, AD, AE, AF, B1
AD	Wide field (FOI 1) Picture Window Upper Position	0	Specify upper edge of window used with “take picture.” The position and size are relative to the virtual image (i.e., not the rotated physical image). **Note:** On a Code Reader, overall image is 960 pixels by 1280 pixels. Upper half is Wide field (FOI 1); lower half is High Density (FOI 0). The High Density field (FOI 0) does not exist on the CR900FD. Also see registers: 36, 43, AB, AC, AE, AF, B1
AE	Wide field (FOI 1) Picture Window Width	500 (#1280)	Specify width of window used with “take picture.” The position and size are relative to the virtual image (i.e., not the rotated physical image). **Note:** On a Code Reader, overall image is 960 pixels by 1280 pixels. Upper half is Wide field (FOI 1); lower half is High Density (FOI 0). The High Density field (FOI 0) does not exist on the CR900FD. Also see registers: 36, 43, AB, AC, AD, AF, B1

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Reg	Setting Name	Default (Hex)	Comment
AF	Wide field (FOI 1) Picture Window Height	3C0 (#960)	Specify height of window used with “take picture.” The position and size are relative to the virtual image (i.e., not the rotated physical image). **Note:** On a Code Reader, overall image is 960 pixels by 1280 pixels. Upper half is Wide field (FOI 1); lower half is High Density (FOI 0). The High Density field (FOI 0) does not exist on the CR900FD. Also see registers: 36, 43, AB, AC, AD, AE, B1
B0	Target On Before Picture (ms)	3E8 (#1000)	Valid Range: 0 to 7FFFFFFF Milliseconds 0: Target off before picture capture Also see registers: 36, 43, AB, AC, AD, AE, AF
B3	Number Of Retries Before Reader Gives Up Sending Packet	3	Valid Range: 0 to FF Tries **Note:** The value 1 is defined as the original send attempt but no resends. The higher the number the longer each decode attempt can take. Also see register: 42
BF	USB Keyboard Poll Rate	A (#10)	Valid Range: 1 to FF (#255) Milliseconds The Host is requested to poll the USB device at the specified period.

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Reg	Setting Name	Default (Hex)	Comment
C4	Default Event	FF (#255) CR900FD: CR1400: CR1000: CR6000: F0 (#240)	The default value of FF is the idle event. This means that normally, no activity is occurring. However, if the value is set to one of those shown in the list below, then that action will be repeated continuously, unless interrupted by an external trigger or command. Any event other than 0 or FF will prevent the reader from entering power save mode. This register also causes register 86 to be set to 0, unless motion detection (F0) is selected as the default event. Event numbers (same as register 39) 0: No Action 1: Keep Awake 2: Show Target 3: Read In Both Fields (Default) 5: Read In High Density field (FOI 0). See section 8.2 **Note:** The CR900FD does not have a High Density field (FOI 0) 6: Read In Wide field (FOI 1). See section 8.2 7: Take Picture 8: Read In Most Recently Successful Field (#13 To #80): Custom events (handled by JavaScript) (#220): Perform “phone connected” handler (#221): Perform “phone disconnected” handler (#222): Perform “cable disconnected” handler (#223): Perform “reader uncradled” handler (#224): Perform “reader cradled” handler (#225): Perform “cabled connected” handler (#226): Beep F0(#240): Detect motion (#241): Toggle Apple KB mode (Bluetooth KB mode only) (#242): Update behavior based on stand detection FF(#255): Idle Also see register: 39

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Reg	Setting Name	Default (Hex)	Comment
C6	Auto Connect Mode	1	0: No Auto Connect - connect only on “X” and “:” commands and upload events 1: Auto Connect - attempt to establish connection when in idle mode and maintain connection when in standby mode 2: Auto Reconnect - attempt to connect when there is data to send but only within specified time of last valid connection. Also see register EA 3: Auto Connect If Cabled - attempt to connect if Reader is cabled or in charger Bluetooth readers: Also see register 76. Reader will not allow the user to set auto-reconnect on, and store data. If any setting that allows storing data is turned on, auto-reconnect will be turned off, if it is on.
C7	Decoder Wide field (FOI 1) Width	280 (#640)	Valid Range: 1 to 280 (#640) pixels Decoder uses only the specified pixel height in the Wide field (FOI 1). See section 8.2
C8	Decoder Wide field (FOI 1) Height	3C0 (#960)	Valid Range: 1 to 3C0 (#960) pixels Decoder uses only the specified pixel height in the Wide field (FOI 1). See section 8.2
C9	Interleaved 2 Of 5 Lengths	0	The length (number of digits) is always even and can be represented by Bit 1 to Bit 31 without using Bit 0. Bit 0 is used to enable/disable Small Quiet Zone (SMZ). If an Interleaved 2 of 5 has a smaller/shorter than standard quiet zone, Bit 0 can be set to 1 to tolerate the SMZ issue (but also increase the chance of partially decoding the barcode). Max value for C9 is 100. Example: To set length to 10, and • To enable SQZ, set C9 to 11 (=10 + 1) • To disable SQZ, set C9 to 10 (=10 + 0). Also see registers: 6E, 71
CA	Auto Disconnect	0	0: Retain connection until explicit disconnect command 1: Disconnect from the Host when there is nothing to send. (In conjunction with registers C6 and 73, the Reader will connect when there is data to send, send the data, then disconnect (to allow another Reader to connect to the same Host). 2: Retain connection until reader enters sleep mode. Disconnect from the Host when the reader enters sleep mode. **Note:** Only applies to readers using Bluetooth communication modes.

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Reg	Setting Name	Default (Hex)	Comment
CE	Codablock F Symbology	0	0: Disabled 1: Enabled **Note:** This register has no effect on a CR900FD without the proper 2D barcode decoding license.
CF	Macro PDF417 Symbology	0	0: Disabled 1: Enabled **Note:** This register has no effect on a CR900FD without the proper 2D barcode decoding license. Also see registers: 29, 2A
D8	Composite Codes Require Both Elements	1	0: Accept any composite element 1: Only accept composite codes if both elements could be decoded. Also see registers: 34, 4A, DB
D9	Max Connection Wait Time	CR2300: CR2600: CR3600: 0F (#15) CR4405: 5	Valid Range: 0 to 7FFFFFFF Seconds The Reader will attempt connection for up to this amount of time when a connection is explicitly requested, such as when a QuickConnect code is read or an upload is requested (by event or command). **Note:** Only applies to readers using Bluetooth communication modes.
DB	Merge Selected Decodes	0	0: Disabled 1: Enabled When enabled, multiple valid decodes from a single read are concatenated. This includes Composite codes or when multiple barcode reading is enabled. Also see registers: 34, 4A
E3	Trigger 1 Confirmation Time (ms)	0	Valid Range: 0 to 7FFFFFFF Milliseconds The trigger input must be asserted for this amount of time before the trigger event is generated. Setting this value > 0 makes it easier to select combinations of triggers (e.g. trigger 3, which is trigger 1 & 2 asserted together).
E4	Trigger 2 Confirmation Time (ms)	0	Valid Range: 0 to 7FFFFFFF Milliseconds The trigger input must be asserted for this amount of time before the trigger event is generated. Setting this value > 0 makes it easier to select combinations of triggers (e.g. trigger 3, which is trigger 1 & 2 asserted together).

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Reg	Setting Name	Default (Hex)	Comment
E5	Trigger 3 Confirmation Time (ms)	0	Valid Range: 0 to 7FFFFFFF Milliseconds The trigger input must be asserted for this amount of time before the trigger event is generated. Setting this value > 0 makes it easier to select combinations of triggers (e.g. trigger 3, which is trigger 1 & 2 asserted together).
E6	Trigger 4 Confirmation Time (ms)	0	Valid Range: 0 to 7FFFFFFF Milliseconds The trigger input must be asserted for this amount of time before the trigger event is generated. Setting this value > 0 makes it easier to select combinations of triggers (e.g. trigger 3, which is trigger 1 & 2 asserted together).
E7	Trigger 5 Confirmation Time (ms)	0	Valid Range: 0 to 7FFFFFFF Milliseconds The trigger input must be asserted for this amount of time before the trigger event is generated. Setting this value > 0 makes it easier to select combinations of triggers (e.g. trigger 3, which is trigger 1 & 2 asserted together).
E8	Trigger 6 Confirmation Time (ms)	0	Valid Range: 0 to 7FFFFFFF Milliseconds The trigger input must be asserted for this amount of time before the trigger event is generated. Setting this value > 0 makes it easier to select combinations of triggers (e.g. trigger 3, which is trigger 1 & 2 asserted together).
E9	Trigger 7 Confirmation Time (ms)	0	Valid Range: 0 to 7FFFFFFF Milliseconds The trigger input must be asserted for this amount of time before the trigger event is generated. Setting this value > 0 makes it easier to select combinations of triggers (e.g. trigger 3, which is trigger 1 & 2 asserted together).
EB	Maximum Reader To Host Packet Data Size (bytes)	4000 (#16384)	Valid Range: 1 to 4000 (#16384) Bytes
EC	Host Acknowledgement Time Limit Multiplier (ms)	F (#15)	Valid Range: 0 to 7FFFFFFF Milliseconds When Expect Acknowledgement From Host (register 42) is nonzero, the Reader will wait up to Host Acknowledgement Time Limit (register 37) + dataSize * Host Acknowledgement Time Limit Multiplier (register EC) milliseconds to receive an acknowledgement from the Host.
ED	Prefix Decode Result With AIM Symbology Identifiers	0	0: Don't prefix with AIM identifier 1: Prefix decode result with ISO/IEC standard 15424/AIM symbology identifier

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<table>
<tr><th>Reg</th><th>Setting Name</th><th>Default (Hex)</th><th>Comment</th></tr>
<tr><td>F0</td><td>Allow Code 128 Short Margin</td><td>1</td><td>0: Disabled
1: Enabled</td></tr>
<tr><td>F6</td><td>Code 39 Short Margin</td><td>1</td><td>0: disallow short margin Code 39 symbol decoding
1: allow short margin Code 39 symbol decoding</td></tr>
<tr><td>F7</td><td>Code 11 Symbology</td><td>0</td><td>Binary Dip Switch
<table>
<tr><th>Bit</th><th>Controls</th><th>Value</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">Code 11 Decoding with one or two checksum digits checked</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Strip checksum(s) from the result string</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
</table>
Note: The firmware determines whether one-digit or two-digit checksum should be checked internally.</td></tr>
<tr><td>F8</td><td>Pharmacode Symbology</td><td>0</td><td>See Section 11.1 - Pharmacode for more details.
Binary Dip Switch
<table>
<tr><th>Bit</th><th>Controls</th><th>Value</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">Pharmacode decoding</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Support color bar</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Reverse instead of Normal direction</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
</table>
Note: The reader decodes a Pharmacode in either horizontal or vertical orientation by default.</td></tr>
<tr><td>F9</td><td>Pharmacode Bar Count</td><td>1004 (#4100)</td><td>Valid Range: Each 8 bits can be 04 to 10 (#16)
Bit 0 – Bit 7: min bar count, 04 to 10 (#16)
Bit 9 – Bit 15: max bar count, 04 to 10 (#16)</td></tr>
<tr><td>FA</td><td>Pharmacode Min Value</td><td>F (#15)</td><td>Valid Range: F (#15) to 1FFFE (#131070)</td></tr>
<tr><td>FB</td><td>Pharmacode Max Value</td><td>1FFFE (#131070)</td><td>Valid Range: F (#15) to 1FFFE (#131070)</td></tr>
<tr><td>FC</td><td>Keep reading codes as long as button is held down</td><td>0</td><td>0: Disabled (requires button to be released before next scan occurs)
1: Enabled
Note: When enabled, register 159 should be greater than zero.</td></tr>
</table>

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<table>
<tr><th>Reg</th><th>Setting Name</th><th>Default (Hex)</th><th>Comment</th></tr>
<tr><td>10B</td><td>Enable JavaScript</td><td>1</td><td>0: Disabled
1: Enabled

When set to 0 installed scripts are disabled. This can be useful from boot mode for recovering the unit if a non-responsive script is installed.</td></tr>
<tr><td>10C</td><td>Bluetooth Connected Cache Time (Seconds)</td><td>3</td><td>Valid Range: 0 to 7FFFFFFF Seconds

The time the last connection status received from the radio remains valid.

If a request is made during this time since last radio query, the cached status is returned. Otherwise, the Reader will query the radio for connection status (which takes up to 1 second).

Note: Only applies to readers using Bluetooth communication modes.</td></tr>
<tr><td>12D</td><td>Hong Kong 2 Of 5 Symbology</td><td>0</td><td>Binary Dip Switch
<table><tr><th>Bit</th><th>Controls</th><th>Value</th></tr><tr><td rowspan="2">0</td><td rowspan="2">Hong Kong 2 of 5 Decoding</td><td>0: Disabled</td></tr><tr><td>1: Enabled</td></tr></table></td></tr>
<tr><td>12F</td><td>Notify Of Packet Rejection</td><td>1</td><td>0: Disabled
1: Beep 3 times
0x100xx: post event on No-Read, where the lower 8 bits specify the event number. For example, 0x10009 to post Event 0x09.

Specify the behavior when a packet is rejected because of incorrect encryption key, incorrect packet protocol, or CodeXML® Modems locked to a different Reader.

Also see register 39 for a list of events.</td></tr>
<tr><td>137</td><td>PDF417 Handle Invalid Shift</td><td>0</td><td>0: Disabled
1: Enabled

Allows the decoding of PDF417 barcodes that were improperly encoded.

Note: This register has no effect on a CR900FD without the proper 2D barcode decoding license.</td></tr>
<tr><td>154</td><td>Enable Black And White Pictures</td><td>0</td><td>0: Images remain in grey scale.
1: Captured images are converted to black and white.

Converts grey scale images to black and white</td></tr>
</table>

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Reg	Setting Name	Default (Hex)	Comment
159	Ignore Duplicate Code (ms)	0	Valid Range: 0 to 7FFFFFF Milliseconds Consecutive duplicate codes (i.e., codes that contain the same data) are blocked for this amount of time (in milliseconds). 0 turns off blocking of duplicate codes. Also see register: 21C, 2CA
172	Automatically save the Bluetooth connection address	CR2300: CR2600: CR3600: 1	0: Disable 1: Enable The address in the QuickConnect code will be saved if enabled. **Note:** Only applies to readers using Bluetooth communication modes.
173	Enable Bluetooth Encryption	0	0: Disable 1: Enable Full wireless link encryption support for Bluetooth readers added in 0476+. **Note:** PIN must be set to the same value on the reader and remote device for connection to be successful. For Code Modems, please refer to the D018582 Modem ICD document for details on the setPin command.
181	Glare Detection (Reduction)	0	0: Disabled 1: Enabled
1EA	Good Read Duration (ms)	C8 (#200)	Valid Range: 0 to 7FFFFFF Milliseconds Affects beep and vibrate duration.
20E	Motion Detection: Start Delay (ms)	0	Valid Range: 0 to 7FFFFFFF Milliseconds A built-in delay of 200 ms prevents motion detect from detecting motion right after a successful decode. This allows the barcode to be removed without triggering a new decode. Use this register to add an additional delay amount to the built-in delay. Also see registers: 86, 204, 20E
218	Motion Detection Option	0	Binary Dip Switch with bits 1 & 2 comprising a value

Bit	Controls	Value
1	CR6000 Illumination	0: Dark Field illumination
		1: Diffuse Bright Field
2		2: Direct Bright Field
		3: Dark Field and Diffuse Bright Field

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Reg	Setting Name	Default (Hex)	Comment
21B	Reported Board Type	(See Comment column)	Valid Range: 1 to 9999 The firmware will report this number as the "hardware type identifier" field of the reader information string. • CR900FD: 384 (#900) • CR1000: 7 • CR1400: 8 • CR2600: 9 • CR3600: A (#10) • CR2300: 8FC (#2300) • CR4405: C (#12) • CR8000: 6 • CR6000: 1770 (#6000) **Note:** Supported in firmware version 272+
21C	In Stand Extended Duplicate Block Time (ms)	5DC (#1500)	Valid Range: 0 to 7FFFFFF Milliseconds Applies to a Reader in a stand. Consecutive duplicate codes (i.e., codes that contain the same data) are blocked for this amount of time (in milliseconds). 0 turns off blocking of duplicate codes. **Note:** Supported in firmware version 272+ Also see registers: 159, 2CA
21D	USB Speed	0	0: High Speed 1: Full Speed Speed at which USB Connection is made. **Note:** Supported in firmware version 281+
235	Cradled event	0 CR2300: CR2600: CR3600: CR4405: E0 (#224)	This event will be triggered when the reader is placed in its cradle. **Note:** Supported in firmware version 376+ See register C4 for a list of events

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Reg	Setting Name	Default (Hex)	Comment
236	Uncradled event	0 CR2300: CR2600: CR3600: CR4405: DF (#223)	This event will be triggered when the reader is removed from its cradle. **Note:** Supported in firmware version 376+ See register C4 for a list of events
243	Connection Delay (ms) – USB KB	0 CR2300: CR3600: CR2600: CR4405: 1388 (#5000)	This is the additional amount of time that the reader will wait after connecting before sending data. The delay will only be used with the associated communication mode. **Note:** Supported in firmware version 376+
244	Connection Delay (ms) – USB HID	0	This is the additional amount of time that the reader will wait after connecting before sending data. The delay will only be used with the associated communication mode. **Note:** Supported in firmware version 376+
245	Connection Delay (ms) – USB VCOM	0	This is the additional amount of time that the reader will wait after connecting before sending data. The delay will only be used with the associated communication mode. **Note:** Supported in firmware version 376+
246	Connection Delay (ms) – USB HIDPOS	0	This is the additional amount of time that the reader will wait after connecting before sending data. The delay will only be used with the associated communication mode. **Note:** Supported in firmware version 376+
247	Connection Delay (ms) – Bluetooth	0	This is the additional amount of time that the reader will wait after connecting before sending data. The delay will only be used with the associated communication mode. **Note:** Supported in firmware version 376+
249	Connection Delay (ms) – UART	0	This is the additional amount of time that the reader will wait after connecting before sending data. The delay will only be used with the associated communication mode. **Note:** Supported in firmware version 376+

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<table>
<tr><th>Reg</th><th>Setting Name</th><th>Default (Hex)</th><th>Comment</th></tr>
<tr><td>24A</td><td>Han Xin Code</td><td>0</td><td>Binary Dip Switch
<table>
<tr><th>Bit</th><th>Controls</th><th>Value</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">Enable/Disable Han Xin</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
</table>
Note: This register has no effect on a CR900FD without the proper 2D barcode decoding license.</td></tr>
</table>

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<table>
<tr><th>Reg</th><th>Setting Name</th><th>Default (Hex)</th><th>Comment</th></tr>
<tr><td>24F</td><td>Decoding Extras</td><td>0</td><td>This is a bitmask that enables additional decode data post-processing.
Binary Dip Switch
<table>
<tr><th>Bit</th><th>Controls</th><th>Value</th></tr>
<tr><td>0</td><td>Send Code 39 start and stop delimiters</td><td>0: Disabled
1: Enabled</td></tr>
<tr><td>1</td><td>Remove Codabar start and stop delimiters</td><td>0: Disabled
1: Enabled</td></tr>
<tr><td>2</td><td>Forces all decode data (excluding AIM identifier and other prefix/suffix info) to upper case</td><td>0: Disabled
1: Enabled</td></tr>
<tr><td>3</td><td>Forces all decode data (excluding AIM identifier and other prefix/suffix info) to lower case</td><td>0: Disabled
1: Enabled</td></tr>
<tr><td>4</td><td>Removes UPC-A check digit</td><td>0: Disabled
1: Enabled</td></tr>
<tr><td>5</td><td>Removes UPC-A number system digit</td><td>0: Disabled
1: Enabled</td></tr>
<tr><td>6</td><td>Removes UPC-E check digit</td><td>0: Disabled
1: Enabled</td></tr>
<tr><td>7</td><td>Removes UPC-E number system digit</td><td>0: Disabled
1: Enabled</td></tr>
<tr><td>8</td><td>Removes EAN/JAN-13 check digit</td><td>0: Disabled
1: Enabled</td></tr>
<tr><td>9</td><td>Removes EAN/JAN-8 check digit</td><td>0: Disabled
1: Enabled</td></tr>
<tr><td>10</td><td>Convert EAN-8 to EAN-13 (also see register 04D)</td><td>0: Disabled
1: Enabled</td></tr>
<tr><td>11</td><td>Convert UPC-A to EAN-13 (also see register 04D)</td><td>0: Disabled
1: Enabled</td></tr>
<tr><td>12</td><td>Convert Bookland EAN-13 to ISBN</td><td>0: Disabled
1: Enabled</td></tr>
<tr><td>13</td><td>Convert Bookland EAN-13 to ISSN</td><td>0: Disabled
1: Enabled</td></tr>
<tr><td>14</td><td>Send Tri-Optic Code 39 start and stop delimiters</td><td>0: Disabled
1: Enabled</td></tr>
<tr><td>15</td><td>Remove GS1 Databar “()” characters, if present</td><td>0: Disabled
1: Enabled</td></tr>
</table></td></tr>
</table>

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<table>
<tr><th>Reg</th><th>Setting Name</th><th>Default (Hex)</th><th>Comment</th></tr>
<tr><td>250</td><td>Korean Post Symbology</td><td>0</td><td>0: Disabled
1: Enabled</td></tr>
<tr><td>251</td><td>Background Transmit Enable</td><td>1

CR4405:
0</td><td>Enables use of background transmit feature. With this enabled, user may be able to scan barcode labels faster than the reader or modem can output the data to the host.

Note: Supported in firmware versions 0449+.</td></tr>
<tr><td>256</td><td>Decoding Options</td><td>10
(#16)</td><td>CortexDecoder decoding options. (DPM license supported in CD13.2.11+)
Binary Dip Switch
<table>
<tr><th>Bit</th><th>Controls</th><th>Value</th></tr>
<tr><td>0</td><td>Reserved</td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>1</td><td>Basic Laser DPM</td><td>0: Disabled</td></tr>
<tr><td></td><td></td><td>1: Enabled</td></tr>
<tr><td>2</td><td>Basic inkjet/dot peen DPM</td><td>0: Disabled</td></tr>
<tr><td></td><td></td><td>1: Enabled</td></tr>
<tr><td>4</td><td>Low Contrast 1D</td><td>0: Disabled</td></tr>
<tr><td></td><td></td><td>1: Enabled</td></tr>
<tr><td>5</td><td>Dot peen dark on light (need DPM license)</td><td>0: Disabled</td></tr>
<tr><td></td><td></td><td>1: Enabled</td></tr>
<tr><td>6</td><td>Dot peen light on dark (need DPM license)</td><td>0: Disabled</td></tr>
<tr><td></td><td></td><td>1: Enabled</td></tr>
<tr><td>7</td><td>Laser/chem etch (need DPM license)</td><td>0: Disabled</td></tr>
<tr><td></td><td></td><td>1: Enabled</td></tr>
<tr><td>8</td><td>Reserved</td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td>25B</td><td>Bluetooth Keyboard Discoverable Time (sec)</td><td>1E (#30)</td><td>The time that the reader will be discoverable to other Bluetooth devices when discoverable command is sent to the reader (see Section 12.1 for more info on discoverable command)

Note: Supported in firmware version 570+</td></tr>
<tr><td>25D</td><td>Disconnect when Set Discoverable</td><td>1</td><td>Disconnect on set discoverable (see Section 12.1 for more info on discoverable command)

0 – Do not disconnect when discoverable
1 –Disconnect when discoverable

Note: Supported in firmware version 570+</td></tr>
</table>

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Reg	Setting Name	Default (Hex)	Comment
25E	Connection Delay (ms) – Bluetooth Keyboard	0	This is the additional amount of time that the reader will wait after connecting before sending data. The delay will only be used with the associated communication mode. **Note:** Supported in firmware version 570+
270	Requested Download Memory Allocation Size	0	This is the optimal amount of memory to allocate for the current file download to the reader.
271	Connection Delay (ms) – iAP2 External Accessory mode	0	This is the additional amount of time that the reader will wait after connecting before sending data. The delay will only be used with the associated communication mode. **Note:** Supported in CR4405 firmware version 622+
272	Connection Delay (ms) – iAP2 Keyboard mode	0	This is the additional amount of time that the reader will wait after connecting before sending data. The delay will only be used with the associated communication mode. **Note:** Supported in CR4405 firmware version 622+
273	Max Error Log Size (bytes)	C8 * 1000 ((#200) * (#1024))	This is the maximum size of the error log in bytes. It will not exceed it by more than the size of one error log entry.
274	Error Log Truncation Percent	46 (#70)	When the error log exceeds the maximum length, it will be truncated to this percentage of its maximum size
277	Max Motion Brightness Percent	3C (#60)	**Note:** Supported in firmware version 655+
278	Low Battery Sleep Voltage (mV)	0 CR4405: C1C (#3100)	The reader will automatically sleep when the battery voltage is below this threshold. **Note:** Supported on CR4405 only.
279	Low Battery Sleep Wakeup Voltage (mV)	0 CR4405: ED8 (#3800)	If the reader automatically sleeps because of a low battery, it will wake automatically if the battery voltage goes above this level. **Note:** Supported on CR4405 only.
27B	Cabled Event	0 CR4405: E1 (#225)	This event will be triggered when the reader is connected via a cable. **Note:** Supported on CR4405 only. See register C4 for a list of events
27C	Uncabled Event	0 CR4405: DE (#222)	This event will be triggered when the reader is disconnected from its cable. **Note:** Supported on CR4405 only. See register C4 for a list of events

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Reg	Setting Name	Default (Hex)	Comment
27D	Phone Connected Event	DC (#220)	This event will be triggered when a phone is connected to the reader. **Note:** Supported on CR4405 only. See register C4 for a list of events
27E	Phone Disconnected Event	DD (#221)	This event will be triggered when a phone is disconnected from the reader. **Note:** Supported on CR4405 only. See register C4 for a list of events
27F	Low Battery Level (%)	A (#10)	Used for battery status indication **Note:** Supported on CR4405 only.
280	Medium Battery Level (%)	1E (#30)	Used for battery status indication **Note:** Supported on CR4405 only.
282	Sled Battery Critical Level (%)	F #15	Reader will not supply current to a connected phone below this level. This applies to all power management schemes. **Note:** Supported on CR4405 only. Also see registers: 282, 283, 284, 285, 29C, 29D, 2AF, 2B0, 2C5
283	Sled Battery Delta To Start Charge (%)	5	If the reader stops supplying current to a connected phone due to the Critical Sled Battery level (0x282), it must rise above the threshold by this amount before it will charge again. Deprecated in 0678+ for customer available charging modes (always charge and managed charged modes). **Note:** Supported on CR4405 only. Also see registers: 282, 283, 284, 285, 29C, 29D, 2AF, 2B0, 2C5

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Reg	Setting Name	Default (Hex)	Comment
284	Device Battery Charge Mode	2	Defines the way in which the reader will attempt to charge a connected device/phone. All power schemes involving charging the device will stop charging when the critical sled battery level is reached (register 282). 0 = Do not charge 1 = Keep phone fully charged 2 = Managed Power Scheme: • Never charge device (phone) if sled battery is below value in register 282 (Sled battery critical level). This always trumps other conditions that would normally initiate device (phone) charging. • Assuming first condition is not true, always charge phone until sled battery drops below value in register 29D. This is the reserve amount of sled battery required to maintain desired scanner usage (Typically ~12 hours, 100 scans/hr). • Charge phone if device battery drops below value in register 29C. Cancel charging when device battery rises above the value in register 29C added to the value in register 285. **Note:** Supported on CR4405 only. Also see registers: 282, 283, 284, 285, 29C, 29D, 2AF, 2B0, 2C5
285	Device Battery Delta To Stop Charge (%)	5	Applies to charging mode 2 (Managed Power Scheme) of register 284. If sled is charging device due to the device critical level being met (see register 29C), the device battery level will need to rise above the critical level threshold (register 29B) by this amount before sled disables charging. **Note:** Supported on CR4405 only. Also see registers: 282, 283, 284, 285, 29C, 29D, 2AF, 2B0, 2C5
286	Device Battery Update Max Interval (ms)	493E0 (#300000)	If this amount of time (ms) elapses without a device battery update, only the sled battery percentage is used to determine whether the device charging state should be changed. **Note:** Supported on CR4405 only. **Note:** Applies to charge mode option 2 only Also see register 284.
288	Full Battery Level (%)	5F (#95)	Used for battery status indication **Note:** Supported on CR4405 only.

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Reg	Setting Name	Default (Hex)	Comment
289	Low Battery Pre Indicate Period (ms)	1F4 (#500)	When indicating a low battery (and not charging), this is the time between the triggering event (such as a button press) and the first blink. **Note:** Supported on CR4405 only.
28A	Low Battery Indicate Period (ms)	1F4 (#500)	When indicating a low battery (and not charging), this is the blink duration. **Note:** Supported on CR4405 only.
28B	Low Battery Post Indicate Period (ms)	1F4 (#500)	When indicating a low battery (and not charging), this is the time between blinks. **Note:** Supported on CR4405 only.
28C	Low Battery Indicate Pulses	3	When indicating a low battery (and not charging), this is the number of blinks that will occur due to a triggering event (such as a button press). **Note:** Supported on CR4405 only.
28D	Medium Battery Pre Indicate Period (ms)	1F4 (#500)	When indicating a medium battery (and not charging), this is the time between the triggering event (such as a button press) and the first blink. **Note:** Supported on CR4405 only.
28E	Medium Battery Indicate Period (ms)	1F4 (#500)	When indicating a medium battery (and not charging), this is the blink duration. **Note:** Supported on CR4405 only.
28F	Medium Battery Post Indicate Period (ms)	1F4 (#500)	When indicating a medium battery (and not charging), this is the time between blinks. **Note:** Supported on CR4405 only.
290	Medium Battery Indicate Pulses	3	When indicating a medium battery (and not charging), this is the number of blinks that will occur due to a triggering event (such as a button press). **Note:** Supported on CR4405 only.
291	Low Battery Charging Indicate Period (ms)	1F4 (#500)	When indicating a low battery while charging, this is the duration of each LED color display in the color sequence (see register 297). **Note:** Supported on CR4405 only.
292	Medium Battery Charging Indicate Period (ms)	1F4 (#500)	When indicating a medium battery while charging, this is the duration of each LED color display in the color sequence (see register 298). **Note:** Supported on CR4405 only.

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Reg	Setting Name	Default (Hex)	Comment
293	High Battery Charging Indicate Period (ms)	1F4 (#500)	When indicating a high (but not yet fully charged) battery while charging, this is the duration of each LED color display in the color sequence (see register 299). **Note:** Supported on CR4405 only.
294	Low Battery Charging Post Indicate Period (ms)	1F4 (#500)	When indicating a low battery while charging, this is the time between LED color sequences (which are defined in register 297). **Note:** Supported on CR4405 only.
295	Medium Battery Charging Post Indicate Period (ms)	1F4 (#500)	When indicating a medium battery while charging, this is the time between LED color sequences (which are defined in register 298). **Note:** Supported on CR4405 only.
296	High Battery Charging Post Indicate Period (ms)	1F4 (#500)	When indicating a high (but not yet fully charged) battery while charging, this is the time between LED color sequences (which are defined in register 299). **Note:** Supported on CR4405 only.
297	Low Battery Charging Indicate Colors	1	Colors to display when charging the battery and the battery is low. Color order is always red, yellow, green, but each color is enabled or disabled with the following bitmask: 0x01 = red 0x02 = yellow 0x04 = green **Note:** Supported on CR4405 only.
298	Medium Battery Charging Indicate Colors	2	Colors to display when charging the battery and the battery is medium. Color order is always red, yellow, green, but each color is enabled or disabled with the following bitmask: 0x01 = red 0x02 = yellow 0x04 = green **Note:** Supported on CR4405 only.
299	High Battery Charging Indicate Colors	4	Colors to display when charging the battery and the battery is high. Color order is always red, yellow, green, but each color is enabled or disabled with the following bitmask: 0x01 = red 0x02 = yellow 0x04 = green **Note:** Supported on CR4405 only.

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Reg	Setting Name	Default (Hex)	Comment
29C	Device Battery Critical Level	19 (#25)	Only applies to charging mode 2 in charging mode register 284. If device battery drops below this level, sled will start charging the device. **Note:** Supported on CR4405 only. Also see register: 282, 283, 284, 285, 29C, 29D, 2AF, 2B0, 2C5
29D	Sled Battery Reserve Level	28 (#40)	Only applies to charging mode 2 in charging mode register 284. Sled will charge device battery until sled battery drops below the percentage value in this register. **Note:** Supported on CR4405 only. Also see register: 282, 283, 284, 285, 29C, 29D, 2AF, 2B0, 2C5
29E	Lower battery percent scaling	0	Reader will report 0% battery capacity if the actual battery drops below this percent.
29F	Upper battery percent scaling	64 (#100) CR4405: 5A (#90)	Reader will report 100% battery capacity if the actual battery rises above this percent.
2A8	Use demo script	0 CR3600:1	Setting this parameter to a 1 on a device that has a display will cause the device to use the demo script instead of the ".default.js" script.
2AB	Detect charging base as stand	0	If set to 1, for readers with a charging base, the reader will be considered "in the stand" if the reader is in the charging base. **Note:** Applies to Bluetooth readers only. Also see registers: 2BE, 2BF, 2C0, 2C1, 2C2, 2C3
2AF	USB passthrough mode minimum battery capacity (%)	5	When in USB passthrough mode, if the sled battery drops to or below this level, the sled will stop providing power to the iPhone. **Note:** This will cause a communications failure between the iPhone and the USB host, but it is necessary to prevent sled reboots that would also cause communications failures. **Note:** Supported on CR4405 only. Also see register: 282, 283, 284, 285, 29C, 29D, 2AF, 2B0, 2C5

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<table>
<tr><th>Reg</th><th>Setting Name</th><th>Default (Hex)</th><th>Comment</th></tr>
<tr><td>2B0</td><td>USB passthrough mode hysteresis battery capacity (%)</td><td>19
(#25)</td><td>When in USB passthrough mode, if the sled battery drops below the USB passthrough mode minimum battery capacity, the sled battery must reach this higher capacity before power (and communication) will be restored to the iPhone.

Note: Supported on CR4405 only.

Also see register: 282, 283, 284, 285, 29C, 29D, 2AF, 2B0, 2C5</td></tr>
<tr><td>2B4</td><td>Public Sector Behavior</td><td>0</td><td>Binary Dip Switch
<table>
<tr><th>Bit</th><th>Controls</th><th>Value</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">Enable public-sector parsing</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Enable JSON formatting</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Reject raw data (non-public-sector-formatted decodes are considered an error condition)</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
</table></td></tr>
<tr><td>2B6</td><td>Trigger 1 Release Event</td><td>0</td><td>If non-zero, the specified event is generated when this button is released.

Also see register: 39</td></tr>
<tr><td>2B7</td><td>Trigger 2 Release Event</td><td>0</td><td>If non-zero, the specified event is generated when this button is released.

Also see register: 39</td></tr>
<tr><td>2B8</td><td>Trigger 3 Release Event</td><td>0</td><td>If non-zero, the specified event is generated when this button is released.

Also see register: 39</td></tr>
<tr><td>2B9</td><td>Trigger 4 Release Event</td><td>0</td><td>If non-zero, the specified event is generated when this button is released.

Also see register: 39</td></tr>
<tr><td>2BA</td><td>Trigger 5 Release Event</td><td>0</td><td>If non-zero, the specified event is generated when this button is released.

Also see register: 39</td></tr>
<tr><td>2BB</td><td>Triggger 6 Release Event</td><td>0</td><td>If non-zero, the specified event is generated when this button is released.

Also see register: 39</td></tr>
<tr><td>2BC</td><td>Trigger 7 Release Event</td><td>0</td><td>If non-zero, the specified event is generated when this button is released.

Also see register: 39</td></tr>
</table>

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Reg	Setting Name	Default (Hex)	Comment
2BD	Allowed Repeated JavaScript Button Events	0	0: If the button event is a JavaScript event, the button event will only be generated once. 1: If the button event is a JavaScript event, the button event will continue to be generated until the button is released.
2BE	In Stand Event	0 CR2300: CR2600: CR3600: F2 (#242)	This event will be posted when the reader is placed in its stand. **Note:** Applies to Bluetooth readers only. Also see registers 2AB to define the charging base as a 'Stand' and C4 for a list of events
2BF	Out of Stand Event	0 CR2300: CR2600: CR3600: F2 (#242)	This event will be posted when the reader is removed from its stand. **Note:** Applies to Bluetooth readers only. Also see registers 2AB to define the charging base as a 'Stand' and C4 for a list of events
2C2	In Stand Default Event	FF (#255) CR2300: CR2600: CR3600: F0 (#240)	When the reader is placed in the stand and stand detection is enabled, register C4 will be set to the value in this register. **Note:** Applies to Bluetooth readers only. Also see registers 2AB to define the charging base as a 'Stand' and C4 for a list of events
2C3	Out of Stand Default Event	FF (#255)	When the reader is removed from the stand and stand detection is enabled, register C4 will be set to the value in this register. **Note:** Applies to Bluetooth readers only. Also see registers 2AB to define the charging base as a 'Stand' and C4 for a list of events
2C4	Minimum Motion Illumination Percent	1 CR6000: CR3600 DPM: 3	This is the minimum illumination that will be used when in motion detection mode. Also see register: 206

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Reg	Setting Name	Default (Hex)	Comment
2C5	Minimum Initial Battery Percent to power iPhone	5	In iPhone communication modes (Apple App mode and Apple Keyboard mode, currently) the reader will not provide any power or communication channel to the iPhone until it has confirmed that the sled battery is above this percent. **Note:** Supported on CR4405 only. Also see register: 282, 283, 284, 285, 29C, 29D, 2AF, 2B0, 2C5
2C6	Keyboard minimum inter-character delay (ms)	0	Require at least this amount of time between characters sent over a keyboard interface. Any value below 3 ms will have no noticeable effect. Also see register: 2C7, 2C8
2C7	Keyboard minimum inter-scan code delay (non-release scan code) (ms)	0	Require at least this amount of time since the last scan code sent over a keyboard interface (this setting is used when the scan code to be sent is not a release scan code). Any value below 3 ms will have no noticeable effect. Also see register: 2C7, 2C8
2C8	Keyboard minimum inter-scan code delay (release scan code) (ms)	0	Require at least this amount of time since the last scan code sent over a keyboard interface (this setting is used when the scan code to be sent is a release scan code). Any value below 3 ms will have no noticeable effect. Also see register: 2C7, 2C8
2C9	Enable vibrate in stand	0	0: Disabled 1: Enabled If Enabled, this setting will allow the reader to vibrate when in the stand. The default is to prevent vibration of the reader while in the stand. **Note:** Readers with a vibration motor are the CR1400, CR2600, CR3600 and CR6000.

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<table>
<tr><th>Reg</th><th>Setting Name</th><th>Default (Hex)</th><th>Comment</th></tr>
<tr><td>2CA</td><td>Extended Duplicate Block Time Options</td><td>1</td><td>Binary Dip Switch
<table>
<tr><th>Bit</th><th>Controls</th><th>Value</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">Use extended duplicate block time if stand detected</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Use extended duplicate block time if in motion detection mode</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Use extended duplicate block time if in continuous scan mode</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Always use extended duplicate block time</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
</table>
Also see register: 159, 21C</td></tr>
<tr><td>2CB</td><td>iPhone Onscreen Keyboard Release Delay (ms)</td><td>7D0 (#2000)</td><td>When the iPhone receives keyboard data from the sled, the onscreen will disappear before sending the first character, and reappear after receiving the last character. This setting is the number of milliseconds that the onscreen keyboard will remain hidden after receiving the last character from the sled. Supported in firmware levels 887+.

Note: Supported on CR4405 only.</td></tr>
<tr><td>2CC</td><td>Allow sending USB scan codes over a Bluetooth SPP connection</td><td>1</td><td>0: Disabled
1: Enabled

If Enabled, the reader will send data as USB scan codes to a modem that requests this behavior, instead of sending just the decoded bytes. If Disabled, or if the modem does not request USB scan codes, the reader will send the data as the decoded bytes.

Note: Supported on Bluetooth readers only.</td></tr>
</table>

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<table>
<tr><th>Reg</th><th>Setting Name</th><th>Default (Hex)</th><th>Comment</th></tr>
<tr><td>2CD</td><td>“On QuickConnect Code” behavior</td><td>0</td><td>This setting defines special behavior that will occur when a QuickConnect Code (QCC) is scanned. A QCC is defined as any barcode that contains the “:%07” command.
<table>
<tr><th>Bits</th><th>Controls</th></tr>
<tr><td>0-15</td><td>QuickConnect Code special operation</td></tr>
<tr><td>16-30</td><td>QuickConnect Code parameter</td></tr>
</table>
QuickConnect Code special operation:
0 = No special operation/behavior
1 = Override communication protocol in 1-way mode
2 = Override communication protocol in 2-way mode
3 = Post an event

QuickConnect Code parameter:
For special operations 1 and 2, this parameter is the desired communication protocol (see register 08).
For special operation 3, this parameter is the event to post (see register C4).

For example, to force the reader into “raw” communication protocol mode when scanning a QCC, set this register to 0x10001. To post the 0x40 JavaScript event after scanning a QCC, set this register to 0x400003.</td></tr>
</table>

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<table>
<tr><th>Reg</th><th>Setting Name</th><th>Default (Hex)</th><th>Comment</th></tr>
<tr><td>2CE</td><td>Motion Detection Pattern Option</td><td>1</td><td>This setting defines the type of pattern detection to be applied after initial motion is detected.
<table>
<tr><th>Bit</th><th>Controls</th><th>Value</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">Basic pattern detection. It has fast response time and can be used for general applications.</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Advance pattern detection. It has better detection for low contrast labels and 2D barcodes but is slower.</td><td>0: Disabled</td></tr>
<tr><td>1: Enabled</td></tr>
</table>
Note:

Without applying any pattern detection (value as 0), the reader will capture an image for decoding when any motion is detected.
When Basic pattern detection is not sensitive enough for some cases, you can turn both Basic and Advance pattern detection ON (value as 3). In this situation, most of the cases will be detected by the Basic pattern detection with fast response time and the Advance pattern detection can detect low contrast labels and some 2D barcodes.
</td></tr>
<tr><td>2CF</td><td>Re-sleep Timer (ms)</td><td>FFFFFFFFFFFFE0C (#-500) (disabled)
CR4405: 45000 (#282624)</td><td>If the auto wake feature is enabled (register 2D0: Full Wake Duration > 0), when the reader auto-wakes from low power sleep mode, it will stay awake for this amount of time (ms) before going back to low power mode. This assumes the user does not perform some other action that would “wake” the reader normally, like press a button.
Also see register: 2D0, 32, 88, 8E, 9F, 2C, 9E</td></tr>
<tr><td>2D0</td><td>Full Wake Period (sec)</td><td>FFFFFFFFFFFFE0C (#-500) (disabled)
CR4405: 900 (15 min)</td><td>If greater than zero, this is the amount of time (sec) that the reader will remain asleep before auto-waking for the duration defined in register 2CF. If zero or negative, feature will be disabled and the reader will never auto-wake.
Also see register: 2CF</td></tr>
</table>

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9 Radio Commands

The Host controls the radio by issuing *':'* commands. The following tables describe the available commands. Command numbers less than 0x80 are Bluetooth commands.

The '#' column is the radio command number (in hexadecimal) to be used with the *':'* command. For example, ":%0E" gets the Bluetooth® device address.

The '# bytes' column indicates how many bytes of data are required as arguments for the command.

9.1 Bluetooth Commands

Name	#	Comments	# bytes
Disconnect	00	Terminate the current connection.	0
Auto Connect	07	If connection information exists for the specified Device Address, use it to establish a connection. Otherwise, attempt to establish a connection and store the resulting information. Address is sent as 12 hexadecimal characters.	6
Clear Setup	08	Remove connection information associated with the specified Bluetooth® Address (as 12 hexadecimal characters).	6
Send Setup	09	Print all connection information in the following format iiii xxxxxxxxxxxx p Where iiii is the storage index, xxxxxxxxxxxx is the Bluetooth® Device Address, and p indicates pairing enabled (y) or pairing disabled (n).	0
Get Bluetooth® Address	0E	Get Bluetooth® address as 12 hexadecimal characters	0
Get "user friendly" name	0F	Get device's "user friendly" name	0
Set Bluetooth PIN	14	Sets the Bluetooth PIN (up to 16 characters). For example, to set to PIN 'abcd', send this command - :%14abcd. Default is '0000'	1-16
Get Bluetooth PIN	15	Gets the Bluetooth PIN	0
Set Reader Discoverable	17	Sets reader into discoverable mode for the time specified in register 25B (default 30 sec). Only applies when reader is in Bluetooth keyboard comm mode.	0

10 Code Reader Batch (CRB) System

The Code Reader Batch (CRB) system is a convenient method for creating and maintaining a set of commands that can be easily sent to the Reader. These CRB files can be created in any text editor with the file extension of .crb. The CRB system accepts all of the valid *text commands*. The most commonly used commands are *C, J*, *N*, *P*, and ~. There should be one command per line. The CRB file may contain empty lines and comments as well.

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The .crb files can be sent directly to the Reader using the normal file transfer. As CRB files are just a list of *text commands*, they can also be sent by a serial terminal program. **Note: if using a serial terminal program the Reader will first need to be commanded in to "text command mode"; see Section 6.1.**

You can request a copy of all the CR1000/CR8000 Configuration codes in the .crb format.

11 Symbology Detail Settings

11.1 PharmaCode

PharmaCode register F8 contains a number of settings that require detailed explanation. Below is a list of valid register values and detailed explanation.

0 = Disable PharmaCode decoding (Default)

1 = Enable PharmaCode decoding, no color bars expected; standard rules for all bars. Horizontally and vertically oriented symbols are decoded. Decoding is performed in the "normal" direction (left bars more significant than right bars for horizontal symbols; top bars more significant than bottom bars for vertical symbols).

3 = Enable PharmaCode decoding, Color bars expected; relaxed contrast rules for the three least significant bars. Horizontally and vertically oriented symbols are decoded. Decoding is performed in the "normal" direction (left bars more significant than right bars for horizontal symbols; top bars more significant than bottom bars for vertical symbols).

9 = Enable PharmaCode decoding, no color bars expected; standard rules for all bars. Horizontally and vertically oriented symbols are decoded. Decoding is performed in the "reverse" direction (right bars more significant than left bars for horizontal symbols; bottom bars more significant than top bars for vertical symbols).

11 = Enable PharmaCode decoding, Color bars expected; relaxed contrast rules for the three least significant bars. Horizontally and vertically oriented symbols are decoded. Decoding is performed in the "reverse" direction (right bars more significant than left bars for horizontal symbols; bottom bars more significant than top bars for vertical symbols).

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12 Appendix: Example CRC16 C Code

The CRC16 required by Reader to Host packets (see Section 5.2) can be calculated using the following sample C code. This CRC16 consists of two consecutive bytes, each in range [0,255] most significant byte first. A CRC16 is calculated on each packet byte, over the entire packet, excluding the *prefix* and the CRC16 itself.

```
crc_t crc = 0;
<send firstByte>
crc = crc(crc, firstByte, firstByteSize);
<send secondByte>
crc = crc(crc, secondByte, secondByteSize)
<…>
<send crcHighByte>
<send crcLowByte>
```

```
/* crc16.h */

#ifndef     crc16_h
    #define crc16_h

    #include <stdint.h>
    #include <stddef.h>

    #ifdef __cplusplus
        extern "C" {
    #endif

    typedef uint16_t crc_t;

    crc_t crc
        ( crc_t                initialCrc
        , const unsigned char* bufPtr
        , size_t               length
        );

    #ifdef __cplusplus
        } // extern "C"
    #endif

#endif
```

```
/* crc16.c */

#include <crc16.h>
```


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```
crc_t crc
    ( crc_t                initialCrc
    , const unsigned char* p
    , size_t               n
    )
{
      enum
      {
          crcBits  = 16,
          charBits = 8,
          diffBits = crcBits - charBits
      };

      crc_t c = initialCrc;

      #include "crc16tab.h"

      while( n-- )
            c = (c << charBits) ^ crcTab[( c >> diffBits ) ^ *p++];

      return c;
}

/*eof*/
```

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```
/* crc16tab.h
 * crc16 table of partial remainders generated by
 * mkcrctab.c with polynomial 1021.
 * included only from within crc() function in file crc16.c
 */

static const crc_t crcTab[] =
{
    0x0000,  0x1021,  0x2042,  0x3063,  0x4084,  0x50a5,  0x60c6,  0x70e7,
    0x8108,  0x9129,  0xa14a,  0xb16b,  0xc18c,  0xd1ad,  0xe1ce,  0xf1ef,
    0x1231,  0x0210,  0x3273,  0x2252,  0x52b5,  0x4294,  0x72f7,  0x62d6,
    0x9339,  0x8318,  0xb37b,  0xa35a,  0xd3bd,  0xc39c,  0xf3ff,  0xe3de,
    0x2462,  0x3443,  0x0420,  0x1401,  0x64e6,  0x74c7,  0x44a4,  0x5485,
    0xa56a,  0xb54b,  0x8528,  0x9509,  0xe5ee,  0xf5cf,  0xc5ac,  0xd58d,
    0x3653,  0x2672,  0x1611,  0x0630,  0x76d7,  0x66f6,  0x5695,  0x46b4,
    0xb75b,  0xa77a,  0x9719,  0x8738,  0xf7df,  0xe7fe,  0xd79d,  0xc7bc,
    0x48c4,  0x58e5,  0x6886,  0x78a7,  0x0840,  0x1861,  0x2802,  0x3823,
    0xc9cc,  0xd9ed,  0xe98e,  0xf9af,  0x8948,  0x9969,  0xa90a,  0xb92b,
    0x5af5,  0x4ad4,  0x7ab7,  0x6a96,  0x1a71,  0x0a50,  0x3a33,  0x2a12,
    0xdbfd,  0xcbdc,  0xfbbf,  0xeb9e,  0x9b79,  0x8b58,  0xbb3b,  0xab1a,
    0x6ca6,  0x7c87,  0x4ce4,  0x5cc5,  0x2c22,  0x3c03,  0x0c60,  0x1c41,
    0xedae,  0xfd8f,  0xcdec,  0xddcd,  0xad2a,  0xbd0b,  0x8d68,  0x9d49,
    0x7e97,  0x6eb6,  0x5ed5,  0x4ef4,  0x3e13,  0x2e32,  0x1e51,  0x0e70,
    0xff9f,  0xefbe,  0xdfdd,  0xcffc,  0xbf1b,  0xaf3a,  0x9f59,  0x8f78,
    0x9188,  0x81a9,  0xb1ca,  0xa1eb,  0xd10c,  0xc12d,  0xf14e,  0xe16f,
    0x1080,  0x00a1,  0x30c2,  0x20e3,  0x5004,  0x4025,  0x7046,  0x6067,
    0x83b9,  0x9398,  0xa3fb,  0xb3da,  0xc33d,  0xd31c,  0xe37f,  0xf35e,
    0x02b1,  0x1290,  0x22f3,  0x32d2,  0x4235,  0x5214,  0x6277,  0x7256,
    0xb5ea,  0xa5cb,  0x95a8,  0x8589,  0xf56e,  0xe54f,  0xd52c,  0xc50d,
    0x34e2,  0x24c3,  0x14a0,  0x0481,  0x7466,  0x6447,  0x5424,  0x4405,
    0xa7db,  0xb7fa,  0x8799,  0x97b8,  0xe75f,  0xf77e,  0xc71d,  0xd73c,
    0x26d3,  0x36f2,  0x0691,  0x16b0,  0x6657,  0x7676,  0x4615,  0x5634,
    0xd94c,  0xc96d,  0xf90e,  0xe92f,  0x99c8,  0x89e9,  0xb98a,  0xa9ab,
    0x5844,  0x4865,  0x7806,  0x6827,  0x18c0,  0x08e1,  0x3882,  0x28a3,
    0xcb7d,  0xdb5c,  0xeb3f,  0xfb1e,  0x8bf9,  0x9bd8,  0xabbb,  0xbb9a,
    0x4a75,  0x5a54,  0x6a37,  0x7a16,  0x0af1,  0x1ad0,  0x2ab3,  0x3a92,
    0xfd2e,  0xed0f,  0xdd6c,  0xcd4d,  0xbdaa,  0xad8b,  0x9de8,  0x8dc9,
    0x7c26,  0x6c07,  0x5c64,  0x4c45,  0x3ca2,  0x2c83,  0x1ce0,  0x0cc1,
    0xef1f,  0xff3e,  0xcf5d,  0xdf7c,  0xaf9b,  0xbfba,  0x8fd9,  0x9ff8,
    0x6e17,  0x7e36,  0x4e55,  0x5e74,  0x2e93,  0x3eb2,  0x0ed1,  0x1ef0,
};

/*eof*/
```

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13 Appendix: Example CRC14 C Code

The CRC14 required by Host to Reader packets (see Section 6.2) can be calculated using the following sample C code. This CRC14 consists of two consecutive bytes, each in range [0,127] most significant byte first. A CRC16 is calculated on each packet byte, over the entire packet, excluding the *prefix* and the CRC16 itself. Bitwise AND each byte of the CRC16 checksum with 0x7F to generate the two bytes of the CRC14 checksum.

```
crc_t crc = 0;

<send firstByte>

crc = crc(crc, firstByte, firstByteSize);

<send secondByte>

crc = crc(crc, secondByte, secondByteSize)

<…>

crcHighByte = (crc >> 8) & 0x7f;
crcLowByte  =  crc       & 0x7f;

<send crcHighByte>
<send crcLowByte>
```

The CRC16 is calculated in 12 Appendix: Example CRC16 C Code above.

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14 Appendix: Custom Keyboard XML File Formatting

To support any USB keyboard the following xml file format is implemented.

Header "<?xml version="1.0" encoding="UTF-8"?>"
Tags:
<charatcterMapping>
Attributes:
"id" identifies the default code set used for mapping to scancodes.
"version" (optional) user supplied version of the mapping.
Data: *none*
Example: <characterMapping id="ascii" version="1">
<Copyright>
Attributes:
"value" (optional) user supplied copyright information.
Data: *none*
Example: <Copyright value="Copyright (c) 2013 The Code Corporation."/>
<history>
Attributes: *none*
Data: *modified tags*
Example: <history><modified version="1" date="2013">*message*</modified></history>
<modified>
Attributes:
"version"
"date"
Data: *string*
Example: <modified version="1" date="2013-04-19">*message*</modified>
<Language>
Attributes:
"name"
"id"
"revision"
"author"
"initials"
Data: *Input tags*
<Input>
Attributes:
"encoding" (not used)
"value"
"printable" (Optional printable character)
"action" (not used)
Data: *Scancodes tags*
Example: <Input encoding="ASCII" value="0000" printable=" " action="none">
<Scancodes>

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Attributes:

“condition” (not used)

Data: *Scancode tags*

Example: <**Scancodes** **condition**="none">

<Scancode>

Attributes:

“value”

“modifier”

Data: *none*

Example: <**Scancode** **value**="00" **modifier**="04"/>

Note : There is a maximum scancode limit of 10 Scancode tags per Scancodes tag

Example *Language.xml* :

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE characterMapping SYSTEM "../CharacterMapping.dtd">
<characterMapping id="ascii" version="1">
    <Copyright value="Copyright (c) 2013 The Code Corporation."/>
    <history>
        <modified version="1" date="2013-04-19">Original table.</modified>
        <modified version="2" date="2013-04-26">Removed inputs above 0xFF</modified>
    </history>
    <Language name="English" id="00" revision="0.1" author="Mark Alan Ashby" initials="MAA">
        <Input encoding="ASCII" value="0000" printable=" " action="none">
            <Scancodes condition="none">
                <Scancode value="00" modifier="04"/>
                <Scancode value="62" modifier="04"/>
                <Scancode value="00" modifier="04"/>
                <Scancode value="00" modifier="00"/>
            </Scancodes>
        </Input>
Repeat <Input><Scancodes><Scancode></Scancode></Scancodes></Input>
    </Language>
</characterMapping>
```

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